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THE
SURGICAL CLINICS
OF
CHICAGO

AUGUST, 1917

VOLUME I—NUMBER 4
WITH 71 ILLUSTRATIONS

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SURGICAL CLINICS OF CHICAGO

Volume 1 Number 4

CLINIC OF DR. ALBERT J. OCHSNER

AUGUSTANA HOSPITAL

CRANIOTOMY FOR JACKSONIAN EPILEPSY

Summary: History and physical examination of a case presenting many of the characteristics typical of post-traumatic Jacksonian epilepsy; anesthesia for head cases; discovery of subdural cyst—management by transplantation of fat and fascia; importance of a salt-free diet in conjunction with bromid medication after operation.

HISTORY

THE patient, a Servian boy of twenty-one years, was admitted to the hospital September 17, 1916, because of epileptic seizures.

His family history is negative. He was never sick before. He denies venereal infection. He has been in this country three years. He is not married.

Five years ago, during an altercation with a fellow workman, the patient was struck on the left side of the head with the sharp edge of an ax, causing a fracture of the bone. He was rendered unconscious immediately and remained so for about one-half hour. He then tried to get up and walk, but found that he was paralyzed on the entire right side and could not talk. He could hear well and remembers everything since then. Several pieces of bone were removed by a doctor at that time and the wound was closed. He remained in bed five weeks, during which time he could not talk nor use the entire right side. The paralysis and the speech gradually improved, but he has always been somewhat weaker on the right side.

Six months ago he had the first attack of ringing in the ears, severe pain in the right arm and right leg, followed immediately by unconsciousness, lasting eight minutes. He recovered quickly and walked home. One month later he had an operation on the left side of the head, and was told that a metal plate was inserted. He was also told that pieces of dirt were present and removed. These were probably introduced during the accident. Three weeks ago he had a second similar attack and yesterday (September 16, 1916) a third. There have been only three attacks in all. His eyesight has not been impaired. He noticed a yellow discharge from the left ear after the second attack three weeks ago. He has been working for four months, but his right side gets tired easily. Otherwise he states that he is perfectly well.

PHYSICAL EXAMINATION

The patient is a well-developed and well-nourished adult. He walks well, but with a marked stoop of the shoulders, which he says has always been present. On the left side of the head there is a horseshoe-shaped scar indicative of a cranioplastic

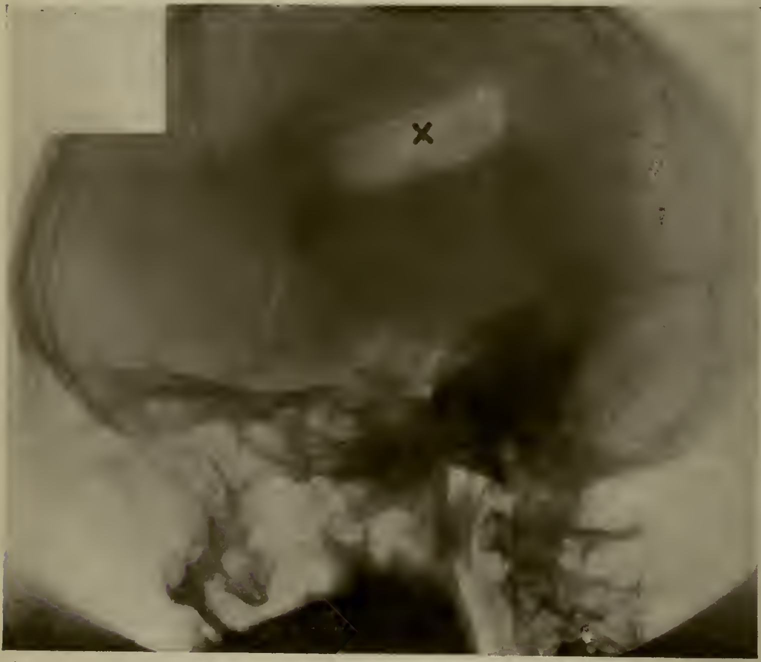

Fig. 253.—Roentgenogram of skull showing defect (X) at site of previous operation.

flap. In the middle of this area is a scar 1.3 cm. wide, 3 cm. long, and roughly crescent in shape, beneath which is a corresponding defect in the bony vault. No tenderness elicited and no loose bodies are felt. There are no defects in sight nor hearing. The neck, chest, heart, and lungs are negative. Abdomen and genitalia are negative. There are no demonstrable differences in the arms or legs. Strength and symmetry are equal. The knee-jerks in both knees are strong and equal. There is no Babinski and no sensory paralysis.

Ophthalmoscopic Examination.—The pupils dilate equally and completely under atropin. The retina of the left eye is greatly discolored, showing evidence of a moderate chorioretinitis. The disk is blurred at the edges and sunken in the center, with the vessels dipping down into it. The vessels are congested but not pulsating. The choking of the disk covers two diopters. The retina of the right eye shows chorioretinitis, as in the other eye. The disk is also choked, but only to the extent of one diopter. The vessels are dilated, but not pulsating.

x-Ray examination discloses an irregular, oblong defect at the site of the previous operation (Fig. 253).

COMMENTS AND OPERATION

Dr. Ochsner (September 20, 1916): The history shows distinctly that we have here a cortical irritation. The injured area is plainly shown. I have a drawing here with which I wish to show where the primary injury was which affected the speech center on the left side, and also the motor areas controlling the upper and lower extremities. This area corresponds to the area of his deformity, and so we shall expect to find the cortical irritation to be due to pressure from protruding bone, old scar-tissue, or an organized blood-clot.

The patient has been given $\frac{1}{4}$ grain of morphin and $\frac{1}{100}$ grain of atropin one-half hour before the anesthesia with ether was begun. This is done so that a minimum amount of anesthetic will be needed during the operation. As a rule, when a patient has been thoroughly anesthetized by this method, it is not necessary to apply any additional anesthetic throughout the course of the operation.

We shall first elevate the head, as in the goiter operation, in order to reduce the blood-supply of the head to a minimum. After shaving the head and preparing the field aseptically, as you see, I shall surround the operated area with these Cushing pins so as to control the hemorrhage as much as possible. We will make our horseshoe-shaped incision larger than the old incision, so that we will have a sufficient amount of space. Cushing has pointed out the great importance of controlling the hemorrhage in all operations on the head, and for that reason we have made pressure with these Cushing needles. The few points of oozing which appear in our incision are caught with mouse-tooth forceps.

I have cut down to the periosteum, making this large skin-flap. You see I made this flap considerably larger than the bone-flap which I shall make. The object is to have the suture line of the skin-flap at a distance from the edge of the bone, so as to prevent adhesions to the skin. Now here, you see, in loosening this skin-flap I have encountered above the former wound in the bone a cyst with a considerable amount of fluid, showing that there exists a pocket of fluid between the scar-tissue and the brain. This cyst alone would be sufficient to cause recurrence of the epileptic seizures. What we have found so far will account for the occurrence of the epileptic attacks, but, of course, we must explore further. You will note that this cyst is still discharging. I shall now loosen the adherent periosteum carefully and then use this knawing forceps to enlarge the bony opening in order to ensure a satisfactory decompression. The bone here is very hard. You have observed from the history the fact that the ophthalmoscopic examination showed the presence of increased intracranial pressure.

Now, I have reached beyond the point at which the dura is adherent below. I shall try and loosen the remaining adhesions that exist. This bone is unusually hard, so that it is almost impossible to cut it away with this forceps. Just at this moment I severed a branch of the posterior meningeal artery. This gives a little flow of blood. We will tampon with gauze to control it. I am extremely careful to leave no rough edges about this opening in order to have no irritation of the cortex. I have followed the edge all the way around. Wherever I find a little sharp edge I cut it away with forceps. Now this mass beneath the dura feels exactly like a cyst. It has a very sharp, definite outline. I must be extremely careful not to cause any irritation by rough manipulations. It is apparent that we have here quite a large organized blood-clot. The connective tissue which has formed in the area of this blood-clot is adherent to the cortex. The quantity of connective tissue has made the approach to this portion of the tissues overlying the brain very difficult, and is undoubtedly sufficient in quantity to cause the irritation which is necessary to bring about the attacks of Jacksonian epilepsy.

We now have two plans of procedure that we may follow. One plan would consist in cutting away this organized clot, necessarily removing with it a small thin layer of brain tissue. That may overcome the convulsions, but it may at the same time cause a certain amount of paresis of the right arm and leg, because this blood-clot is localized over the motor area which supplies those extremities. The second plan is the one which we shall follow, and consists in placing over this entire area a piece of fascia lata containing quite a considerable amount of fat, with the fat directed downward. This is done in the hope of preventing the development of fresh adhesions or the re-formation of the cyst, so that the patient may be given complete and permanent relief. You observe that the fascia-flap that my assistant has made is exactly large enough to cover this entire space, and that it extends underneath the edge of the bone for a distance of ½ to 1 cm., which is quite sufficient to hold it in place. I have adjusted the flap and carried the edge of it underneath the edge of the bone throughout, so that I have no doubt that it will stay in place. Now the question is whether we had not better place a very fine catgut suture in this flap. Of course, in sewing this in place we must be extremely careful not to do anything that might possibly traumatize the under-

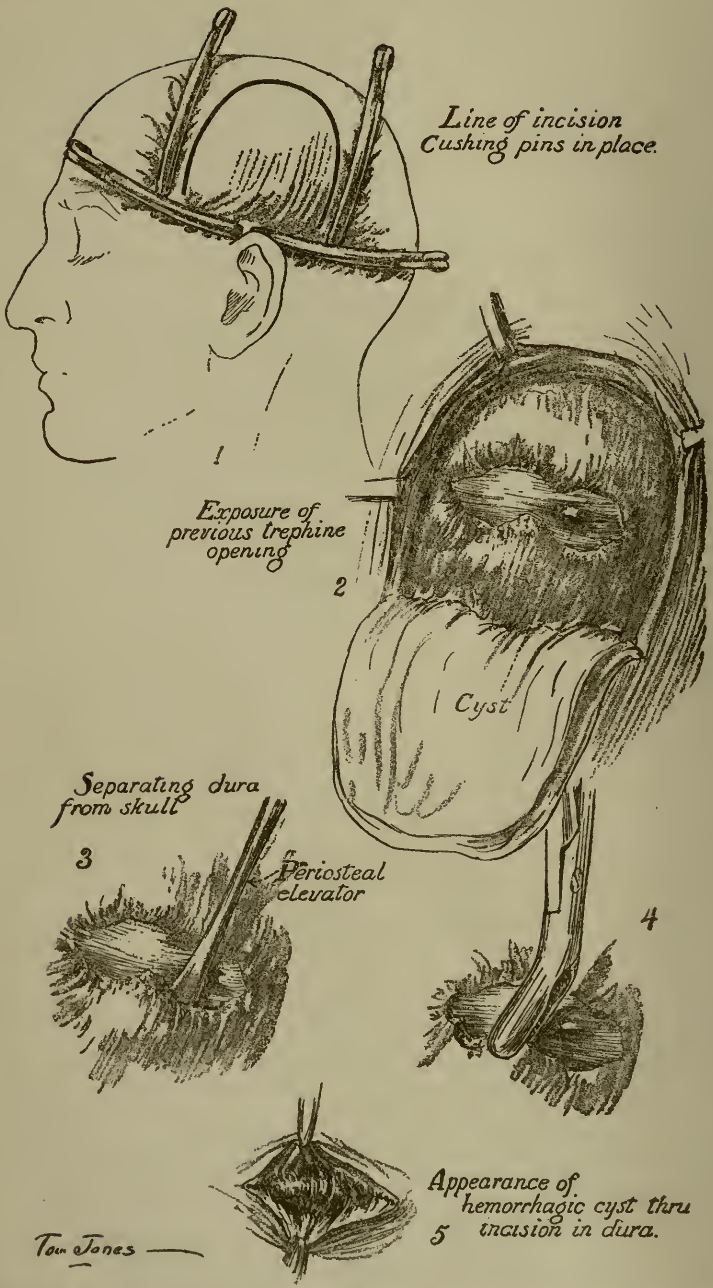
Line of incision
Cushing pins in place.
1
Exposure of previous trephine opening
2
Cyst
Separating dura from skull
3
Periosteal elevator
4
Appearance of hemorrhagic cyst thru incision in dura.
5
Tom Jones

Fig. 254, 1–5.—Hemorrhagic brain cyst. Fat and fascia transplantation into defect.

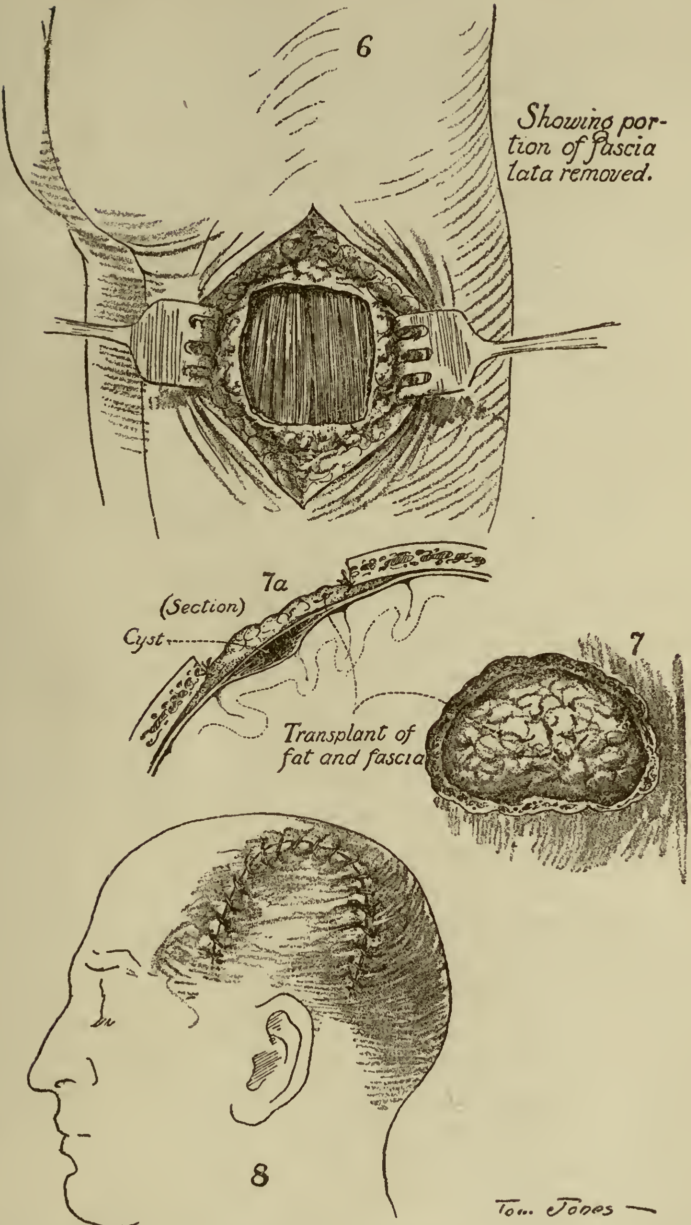
6
Showing portion of fascia lata removed.
7a
(Section)
Cyst
7
Transplant of fat and fascia
8
Tom Jones

Fig. 255, 6–8.—Hemorrhagic brain cyst. Fat and fascia transplantation into defect.

lying dura, which might in the future become a focus of irritation. You see with what care the assistant brings the needle through without causing any traumatism. Now we suture the scalp wound. You see the scalp wound is quite a distance back from the wound in the bone, so that the scar from the scalp wound cannot reach down to the brain and cause irritation. (See Figs. 254, 1–5; 255, 6–8.)

Within a month Dr. Dercum, of Philadelphia, has had an article in the Journal of the American Medical Association in which he described the medical treatment for these cases, and in which he states that he believes that the irritation is reduced by giving these patients a salt-free diet and a small amount of sodium bromid and a very small amount of thyroid extract. In all the patients that we have operated on for this condition for a number of years we have followed this plan after the operation. They are given written directions to the effect that they are to be moderate in their exercise, that they must keep out of the hot sun in summer, that they must never become exhausted, that they must eat a very small amount of meat only, not more than a little meat two or three times a week, and that they must eat almost a salt-free diet. In place of table salt I instruct them to use a small quantity of sodium bromid to season such articles of food, as eggs, for instance, which may be repugnant to them without salt. Since we have instituted this very strict régime following the operation our results have been very much better than when we depended on the operation alone for relief. That is what we will do with this boy. We will see that he gets suitable work, such as farm work, where he does not have to work too hard. We will see that he does not get salt in his food, that he eats but a very small amount of meat, that he does not get exhausted or excited, goes to bed early, has his bowels in good condition, and that he never eats a large meal. Such is the plan by means of which we hope to insure to our patient lasting benefit.

TUMOR IN UNDESCENDED TESTICLE

HISTORY

The patient, a single man of thirty-six years, a letter-carrier by occupation, was admitted to the hospital February 27, 1917, complaining of headache, vomiting, and constipation.

His family and past histories are negative. The present trouble began last October after eating some pork and beans, when he felt sick and vomited all one night. Since then he has had intermittent attacks which have increased lately, and now he says they start with a burning headache, and later he becomes nauseated and vomits. The vomiting seems to be projectile in nature. It is very sour. He says his stomach bloats up and he begins to belch gas. At times this is relieved by the taking of food. The epigastric distress comes on soon after eating. Bowels are constipated. Lately, he has passed some blood in the stools. He thinks he has an undescended testicle, and at times this pains him. He wears a truss for support. He has lost no weight. Does not sleep well at night. He has dull burning headaches generally in the sides of the head. He drinks one or two bottles of beer a day, otherwise his habits are negative.

EXAMINATION

Physical examination shows a well-developed and poorly nourished man. The eyes react to light. The scleræ have a slight yellow tint. Head, neck, lungs, and heart are negative. The skin has a brownish tint. The abdomen is somewhat pendulous. In the right lower quadrant is a hard, smooth, firm mass, about the size of a four- or five-months' pregnant uterus. This is fixed and not painful. Rectal examination shows an enlarged prostate and a tumor mass near the sacrum. There is a mass in the left groin over the inguinal canal. It is not reducible.

COMMENTS AND OPERATION

Dr. Ochsner (February 28, 1917): This tumor is located opposite the internal abdominal ring. It is covered throughout with peritoneum and is perfectly smooth on its external surface. It is attached to the abdominal wall by means of a

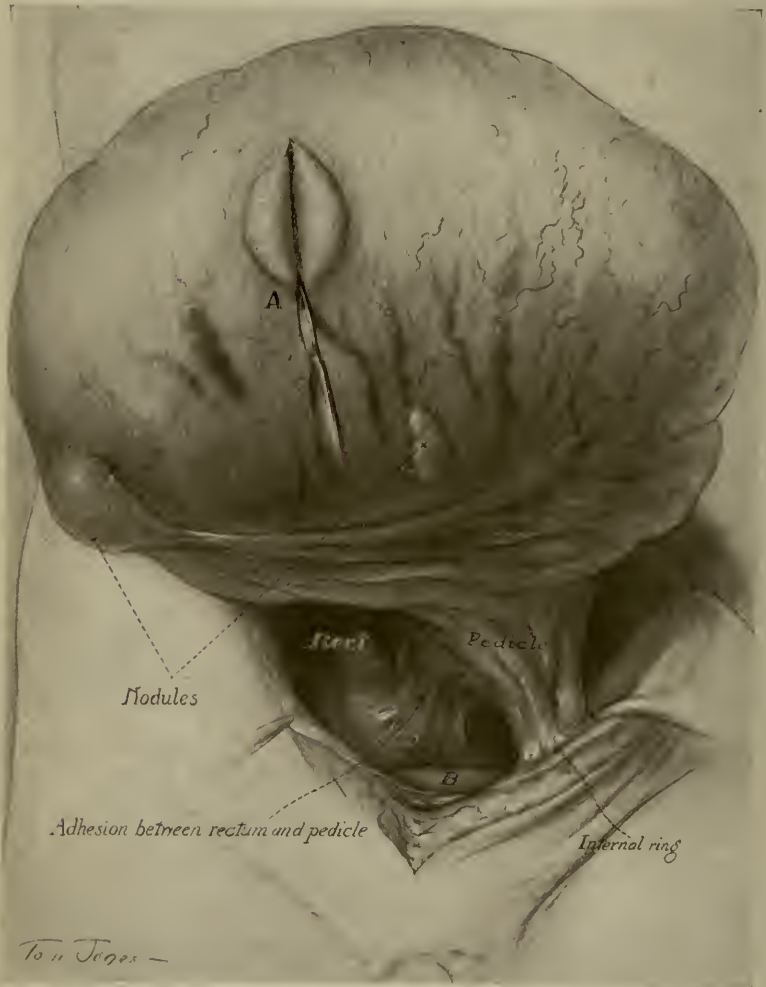

Fig. 256.—Huge tumor of intra-abdominal ectopic testicle delivered through midline incision.

piece of the spermatic cord containing the vas deferens and all the blood-vessels and a fold of peritoneum (Fig. 256). The pedicle is about 5 cm. in diameter. We have grasped it with hemostatic forceps precisely as we would grasp the pedicle of an ovarian cyst. The sigmoid flexure of the colon is attached opposite the edge of the pedicle. This attachment we are going to sever, and then carefully unite the peritoneal edges with silk suture, in order that we may not leave any raw surfaces. For the same reason we will also turn in the stump of the pedicle with a few fine silk sutures. The pedicle we have ligated by transfixing with catgut sutures and tying in sections in order that there may be no possibility of slipping, because the vessels of the spermatic cord which have supported the growth of this tumor are considerably enlarged.

There seems to be some evidence that malignant growths are more likely to occur in undescended testicle than in the case of the organ in its normal position. The most common form of malignant growth is sarcoma, but all forms of malignant growths are found in this organ. Carcinoma is next to sarcoma in frequency, and then comes the malignant growth known as teratoma, which may contain several or all forms of tissue, epithelium, glandular tissue, nerve, fat, muscle, and bone.

Unfortunately, in this patient there is secondary involvement of the left kidney which has a large mass in the lower pole. The liver is free from malignant growth. The lymph-nodes in the left inguinal canal are apparently enlarged, and upon looking further we find a distinct tumor mass in the inguinal canal which fills the canal throughout its course to the upper end of the scrotum. This mass has the appearance of an obliterated hernial sac which has become filled with blood, and which I think also contains malignant tissue. We find no difficulty in enucleating this sac and grasping the blood-vessels in the canal and ligating them. Having removed the sac, we ligate the vessels and close the inguinal canal with a catgut suture.

CLINIC OF DR. ARTHUR DEAN BEVAN

PRESBYTERIAN HOSPITAL

THE TECHNIC OF COLOSTOMY

Summary: A patient with marked stenosis of the entire colon as the result of an inflammatory process of unknown etiology; indications for colostomy; the technic in detail; after-treatment.

I DESIRE to operate on a very interesting case, which gives the following history:

A woman of thirty-five has had for the last four or five years a great deal of difficulty with the rectum and colon. She has been treated for stricture of the rectum. The exact etiology of this stricture is not clear, but with the finger and with the bougie one can find a definite obstruction about 2 inches from the sphincter, and it has been necessary to keep this dilated for several years. In addition, she has had great colon distress associated with periods of diarrhea and a good deal of mucus, and sometimes symptoms suggestive of a beginning obstruction, although never with a complete obstruction.

The *x*-ray picture of the colon injected with barium shows, as you see in this plate, a very unusual and singular condition, a very greatly constricted colon with a little dilatation at the cecum, although the cecum is much less contracted than the rest of the colon.

After studying this case very carefully it has been determined to do an exploratory operation and find out the exact condition of the colon and see what can be done in an operative way to relieve it. Before doing the exploratory I want to say that our clinical diagnosis is that of a long-standing inflammation of the colon of unknown origin. No evidence of tuberculosis or amebiasis has been found. This long-standing inflammation has resulted in a great contraction of the colon and a clinical picture of diarrhea with mucus and sometimes blood. My conception is that the best thing that can be done for this woman to afford her relief is a colostomy made at the cecum, with the idea of placing the entire colon at rest for a number of months. This rest may lead to a cure of the chronic inflammatory process, and it is possible that later we may be able to close the colostomy wound. I want to take the opportunity in this case to show you the technic of colostomy which we have developed in this clinic, which is very simple and which has proved to be very effective.

TECHNIC OF OPERATION

Under ether anesthesia you see that I make a muscle-splitting incision very much the same as the muscle-splitting incision employed in an appendectomy. Through this muscle-splitting incision I introduce my hand and find a most interesting condition as far as the large bowel is concerned. I can trace it out from the cecum along the ascending colon, transverse colon, and descending colon and sigmoid not as a normal large intestine, but as a quite small, contracted bowel, certainly not more than one-third the size of a normal colon and with very hard, stiff, rigid walls, showing that there is a tendency to produce an almost continuous stricture of the large bowel from the cecum to the anus. I cannot say whether this has been due to a tuberculous process, to an amebic infection, to a gonorrheal infection, which sometimes produces a stricture of the rectum, or to some ulcerative process from an unrecognized organism. The condition, however, is certainly unusual, and the changes are so great that I doubt very much whether there is much possibility of the bowel ever returning to anything like a normal condition even after prolonged rest.

Opening the peritoneum I draw out the cecum, which has a short mesentery in this case (Fig. 257, *a*). I then take, as you see, a large needle with good-sized silk thread, and tie this so as to make a double ligature. I pass the needle through one side of the incision and then through the mesentery of the cecum and then out at the other side of the cecum, as you see in Fig. 257, *a* and *b*. A small piece of iodoform gauze is put in the loop of the thread. The opposite loop is cut with a pair of scissors at the middle, and another piece of iodoform gauze is placed that side of the incision and the thread tied as in Fig. 257, *c* and *d*. This holds the loop of large intestine well out of the wound.

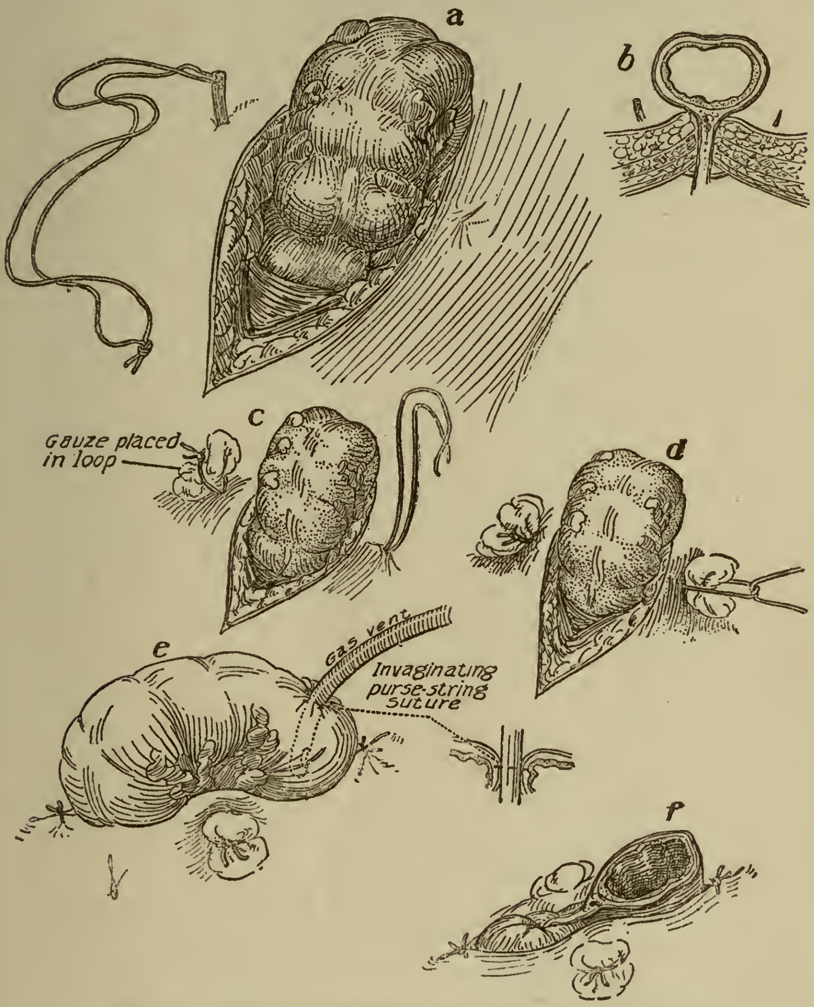

Fig. 257.—Technic of colostomy. (Described in detail in text.)

Now this intestine should not be opened at this sitting. At the same time, in order to relieve the gas-pains and make the patient more comfortable, we always introduce a rubber catheter, about a No. 12, through a small puncture in the proximal end of the intestine, and hold this in place, so that there can be no possibility of leakage, by a purse-string suture (Fig. 257, *e*). Now, I put in two silkworm-gut sutures at each end of the muscle-splitting incision, and this completes the operation. You see how rapidly a colostomy of this kind can be made, and I can assure you that the addition of the rubber catheter securing immediate relief from gas pressure has proved to be a most gratifying improvement. An operation of this kind can, of course, be made under local anesthesia without any difficulty, but in this particular case it was desirable to use ether because I wanted to explore the abdomen thoroughly.

At the end of three days I shall take a cautery and cut out, with the cautery, the rubber tube and enlarge the opening. In this particular case I shall close the distal opening in the cecum, so as to make it impossible for any intestinal contents to pass into the colon beyond the point of the colostomy, as it is distinctly our desire to put that entire segment of intestine at rest. I shall do that, as is well represented in the chart which I show you (Fig. 257, *f*). I shall completely divide the bowel, and this can be done without any anesthetic or, at best, with a little local anesthesia. The distal end of the intestine will be closed by two rows of sutures, one including the mucosa and all the coats of the bowel, and one through the muscularis and peritoneum. I use purse-string sutures in doing this, and secure a certain amount of invagination so as to ensure a perfect closure.

These patients learn to handle their colostomy openings very well by means of specially made cups and dressings, and by educating themselves to have one or two bowel movements a day through the inguinal anus. I have a large number of patients now, especially cases with carcinoma and some from benign obstruction, such as the case under consideration, and cases of diverticulitis requiring an artificial anus, who have learned to make themselves very comfortable and are very happy in spite of the artificial opening. I particularly want to emphasize the points of technic in this method of colostomy, its simplicity, its safety, and the great freedom from distress afforded by the safety-valve action of the catheter.

Postscript.—The later history shows an uninterrupted recovery from the operation and great relief from the former symptoms and a very rapid increase in weight and strength. On account of the very great changes in the intestine, however, it is not considered wise to close the colostomy wound. Possibly at the end of six months or a year, if we can demonstrate by barium injections that there has been marked improvement and return to anything resembling a normal condition of the intestine, and if we can improve very materially the condition of the stricture of the rectum by dilatation, we might consider a closure of the colostomy, but from our present point of view that seems improbable, and I am inclined to think the best plan is for the patient to be satisfied the rest of her life with a permanent colostomy opening.

PROLAPSE OF RECTUM: TECHNIC OF REHN-DE LORME OPERATION UNDER LOCAL ANESTHESIA

The next lesion in the patient I desire to show you involves the rectum and not the colon. This is an example of the great value of the Rehn-De Lorme operation for very extensive rectal prolapse. The history is as follows:

Patient, Mrs. E. A., age forty-three.

History.—Seven or eight years ago the patient noticed a slight protrusion of the rectum at the time of bowel movements. This trouble has gradually grown worse until now a prolapse occurs with every movement and after any lifting or straining. Although the protrusion has been very marked of late there has been no bleeding and no difficulty in replacing the bowel. There has never been much pain. There is no history of constipation. Her general health has always been good, with no history of previous illness. She has had one miscarriage and no other pregnancies.

Physical examination reveals a large-boned, very thin woman. Further examination is entirely negative except in regard to her rectal condition. On bearing down there is a large prolapse of an indeterminate amount of the bowel, probably 3 inches of mucosa becoming visible on continued straining—*i. e.*, a prolapse of 5 to 6 inches of mucosa.

Operation.—After infiltration with novocain and adrenalin (1 : 100,000) of the space between the mucosa and muscularis, a circular incision is made at the mucocutaneous junction. The fibers of the external sphincter, which are widely separated, are brought well into view. The sphincter is now reefed with a row of interrupted catgut sutures for a distance of 2 inches. A second row of sutures reefs the internal sphincter for about 3 inches. About 5 inches of the mucosa is carefully dissected back and amputated. The mucous membrane is then brought down and

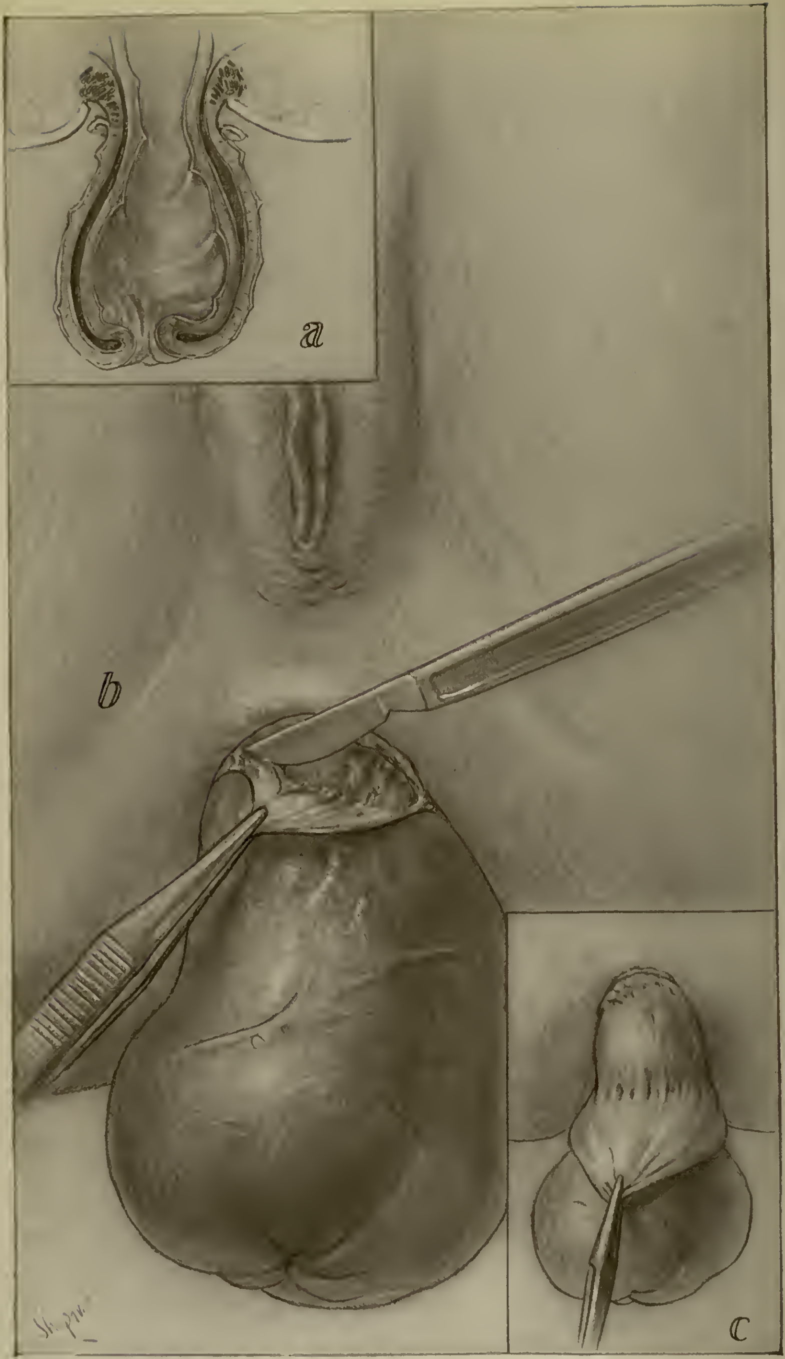

Fig. 258.—*a*, Longitudinal section of prolapse to show its components; *b* and *c*, appearance of prolapse, incision, and dissection of mucous membrane.

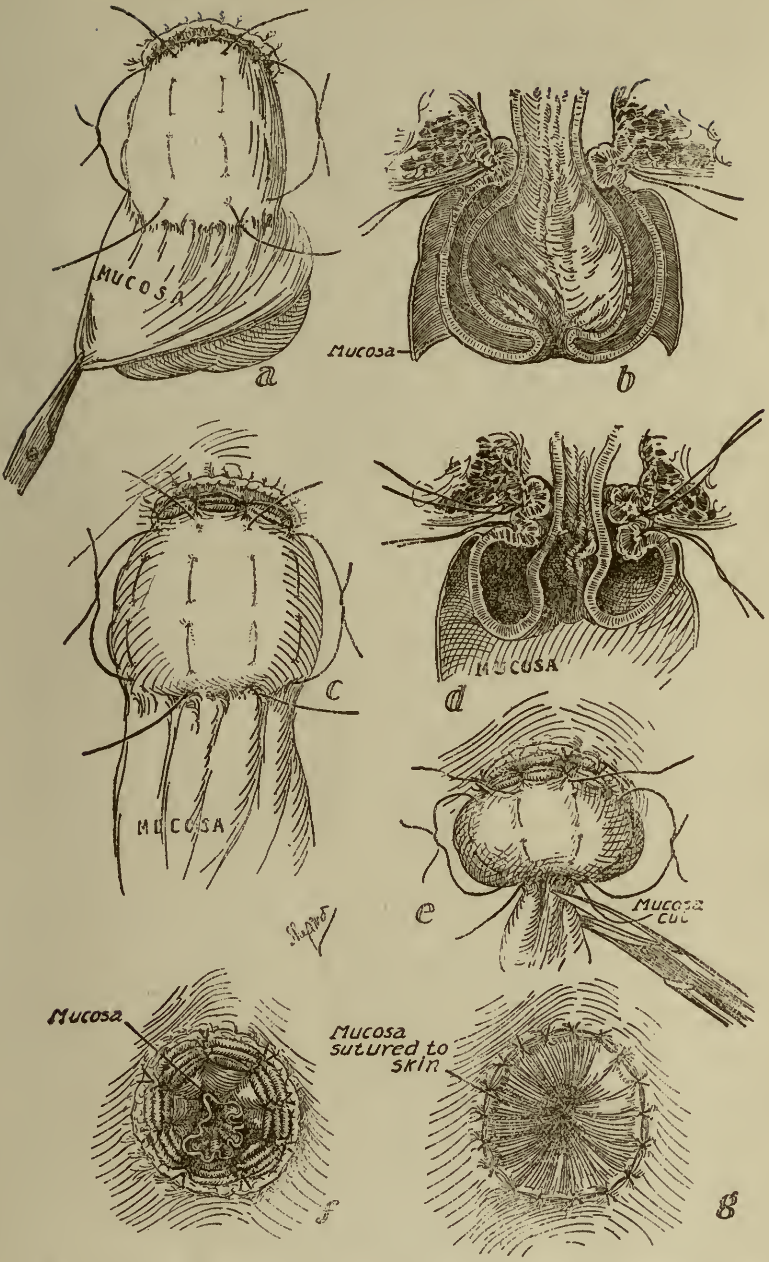

Fig. 259.—Serial diagrams of Rehn-De Lorme operation as described in text.

sewed to the skin with mattress sutures of black silk. This is known as the Rehn-De Lorme operation.

From the limited experience which I have had with this operation it has impressed me as being much the best procedure in these cases of rectal prolapse where we have these great masses of all the coats of the rectum coming down for a distance of 5, 6, or 8 inches, and producing great discomfort and generally incapacitating the patients. The Rehn-De Lorme operation can be done so well under local anesthesia, and it carries with it so little risk, and, as is demonstrated in this patient, it gives, with this reduplication of the musculature of the bowel, a sphincter amputation of the prolapsed mucosa, such an ideal result, that I think we must regard it as the best method that has so far been suggested to handle this distressing lesion.

CLINIC OF DR. KELLOGG SPEED

COOK COUNTY HOSPITAL

DEMONSTRATION OF CASES BEFORE THE CHICAGO SURGICAL SOCIETY, MAY 4, 1917

Summary: I. Carcinoma of the lower lip—removal of tumor with plastic repair of defect; lymphatics of the lower lip—their surgical importance.

II. Decompression for the relief of traumatic epilepsy. Technic of the operation—transplantation of fascia lata; relation between head injuries and epilepsy as indicated by reports from and personal experience in the war hospitals; importance of bromids and lumbar puncture in treatment of head injuries.

III. Decompression for hypophyseal tumor. Diagnosis of tumors in the region of the sella turcica; indications for operation; subtemporal decompression—the problem of hemostasis—steps of the operation; result in present case two weeks after operation.

IV. Occipital decompression for increased intracranial tension, supposedly the result of an old depressed fracture of the skull; blindness and headaches the chief indications for operation.

V. Perforated gastric ulcer. Diagnosis—tendency to confuse late cases with acute appendicitis; value of methylene-blue in locating point of rupture; closure of perforation and drainage the two cardinal points in treatment.

I. CARCINOMA OF THE LOWER LIP

THIS man had a carcinoma of the lower lip. Here is a slide which shows it beautifully. We are always on the trail of cancer and have not yet caught up to the rear guard. How do we know? Marshall[1] found in his State (Wisconsin) that in 1908, 1513 persons were afflicted with carcinoma, whereas in 1913 there were 1755 instances. A natural increase in population accounts for some of this increase, but according to the vital statistics of the United States Government in the period from 1908 to 1913, corresponding to the aforementioned, the increase of cancer death per 100,000 population was from 71.5 to 78.9.

[1] Wis. Med. Jour., xiv, No. 12.

Recently Bloodgood[1] has analyzed the lip carcinomata, selecting patients who have *lived five years or more since operation.* They can be divided into three groups:

Group One: **V**-shaped removal; 63 per cent. cured.

Group Two: **V**-shaped removal plus glands which did not show carcinomatous involvement; 95 per cent. cured.

Group Three: **V**-shaped removal plus glands which *did* show carcinomatous involvement; 50 per cent. cured.

May we compare this with breast cancer, in which the best statistics show us that even when the axillary glands are not infected with the malignant process, the cures are only 80 per cent. after radical operation, while infected axillary glands promise only 20 to 40 per cent. cure after the same procedure.

From the clinical standpoint we must remember the glands and lymphatic vessels which are intimately connected with lip cancer. In order of their involvement they are the submental, submaxillary, and deep cervical glands—the last of which may not show evident involvement for years after evidence of the lip sore. Rather more interesting are the lymphatic vessels draining the lip. They are composed of two groups, the submucous and subcutaneous, and have intense significance in clinical study. The *submucous* lymphatics pass to the submental and submaxillary glands *on the same side.* The subcutaneous lymphatics, however, *pass across* to the glands of the opposite side and intercommunicate. Of what importance is this clinically? Simply this, that if the cancer involves the skin surface of the lip beyond the mucocutaneous margin, one *must* remove the glands on both sides. If the mucous surface alone were cancerous, and the lesion were distinctly unilateral, removal of glands on one side might be ample, but it is wiser to remove both.

The causes of recurrence after operation may be stipulated then as: first, too late intervention; second, incomplete surgery both of the actual lesion and its lymphatic drainage.

The reason I show you this patient is to demonstrate the plastic method of removing the carcinoma and repairing the face, for the most radical operation is always the one of choice before cervical gland involvement. It is now ten days since the operation was performed. He has already a fairly respectable looking mouth and lower lip (Fig. 260). He has also a restoration of the mucous membrane across the lip and a complete healing of the lip in the midline. The incision through which the glands were removed from the submaxillary region has practically healed.

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[1] Surg., Gyn. and Obst., 1914.

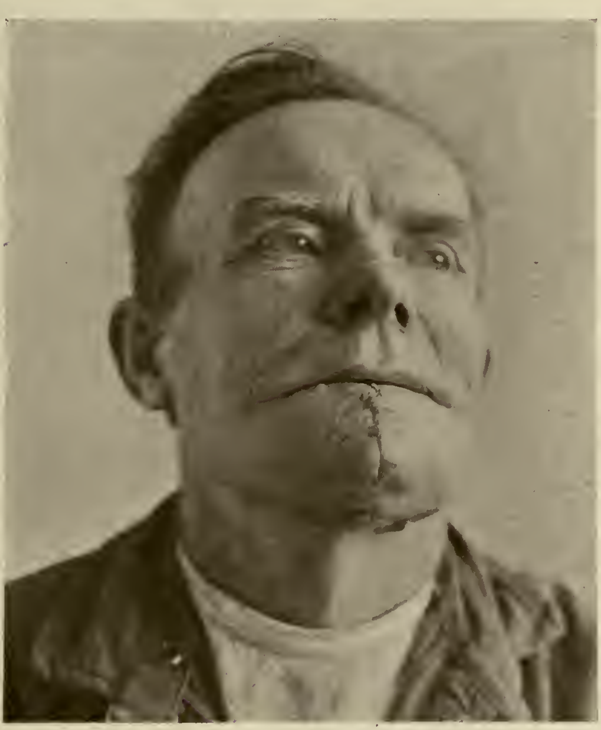


Fig. 260.—Case I: Photograph of patient ten days after operation.

A word about the technic of the operation. To obtain a closure of the lip after a resection of a large portion of it, it is desirable to make a plastic which does not have tension on the flaps. You see he has a fairly pliable loose lower lip. He can open his mouth widely and there has been no tension on the scar. We must consider first a method of incision for the removal of tumor masses. We make a **V**-shaped incision, going

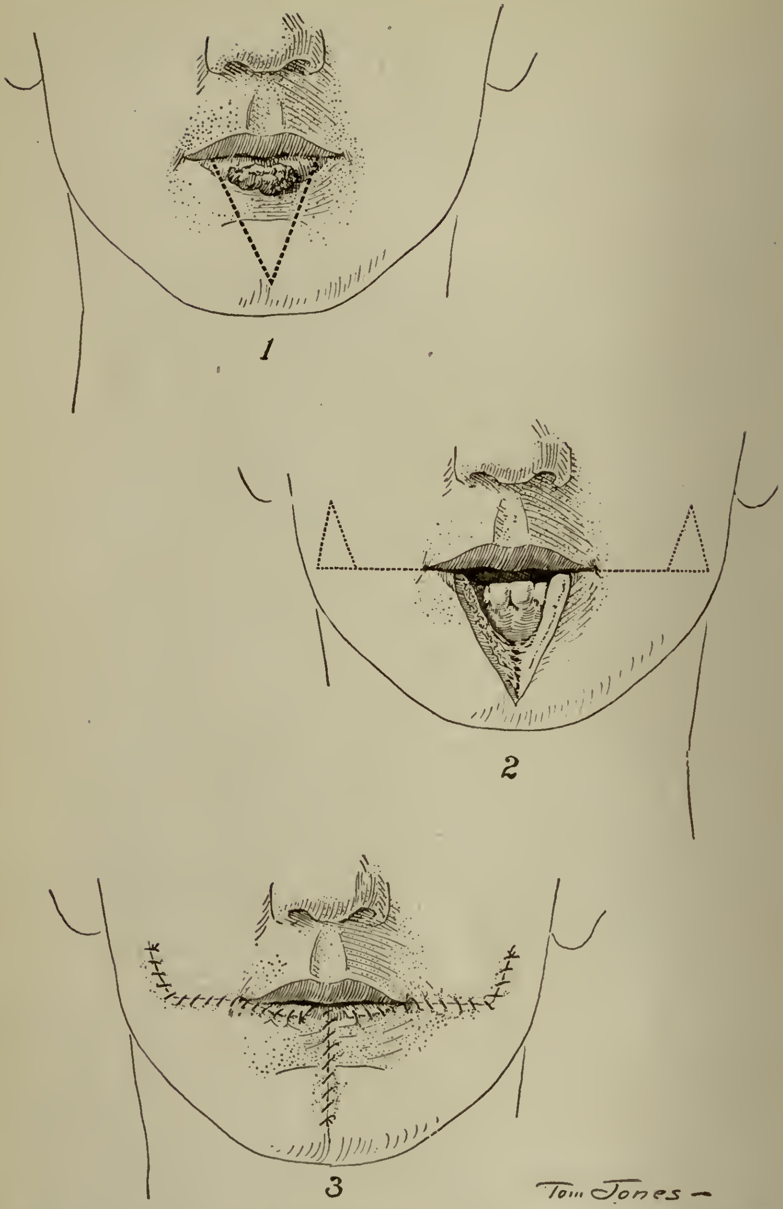


Fig. 261.—Case I: *1*, Outline of **V**-shaped incision. *2*, Lateral and triangular incisions used in plastic repair of defects in lip. *3*, Operation completed.

wide of the tumor mass and well down to the point of the chin (Fig. 261, 1). After that has been carefully removed and the bleeding stopped, a lateral incision directly from the corner of the mouth on either side is made onto the cheek. A longer cheek incision is made on the side of the lip that is most sacrificed. We then proceed to make a triangular opening, the apex directed upward at the distal end of the lateral incision (Fig. 261, 2). We do not make an attempt to go through more than the skin and muscular tissue, aiming to preserve the mucous tissue on the inside of the mouth. By slipping over the triangular edges after skin denudation the lip-flaps are brought toward each other in the central line, and we are able to approximate them snugly, perhaps by undermining them slightly from the lower jaw, and, as the tissue moves in this central direction, we find that this angle of the cheek triangle comes over until we have remaining no triangular opening, but simply a linear mark. One is surprised when it is healed to find what a fine mark is left. In a few weeks one will hardly be able to find this very fine scar. On the lateral surface the new lip and face are closed by sutures taking in a fair margin of skin (Fig. 261, 3). This method gives us flaps without tension and the scar in the lateral part of the cheek is reduced to a minimum.

In addition to that part of the operation, of course we try to be thorough and remove the metastases. This case had a history of seven months' duration. Although there were no palpable glands in the submaxillary region, we made an opening here, exposed that area, and removed both the submaxillary salivary and submaxillary lymph-glands. Some of the lymph-glands were as large as a small bean and very hard, but microscopic section fortunately does not show any evidence of metastases. We believe, consequently, that this is a very favorable case from the standpoint of recurrence, from cosmetic results, and general repair of the whole face.

II. DECOMPRESSION FOR THE RELIEF OF TRAUMATIC EPILEPSY

This man has a history of epilepsy following an ax blow. According to his story, he was operated upon by the late Dr.

Nicholas Senn, but that seems improbable, as I believe Dr. Senn has been dead more than eight years. At any rate, at that time he had a depressed fracture which was relieved in part. The skiagram which you see here shows now more or less defect in the frontal bone. The epileptic seizures, to go very briefly into the history, are mostly at night, the fits coming on when he is asleep. He awakens to find the pillow covered by blood. The last attack occurred on the street, and he was picked up and brought to the hospital. The Wassermann is negative. There is nothing of any importance in the physical findings. There are no pareses nor paralyses, nothing to show any involvement of more than the cortical area.

In the technic of opening these head cases we try to be very simple. A tourniquet is placed on the scalp outside of a sterile towel. In this case today it does not work very well because the rubber broke just as we were putting it on. In opening a skull with that kind of technic one has no difficulty with scalp bleeding, which is otherwise always bothersome. I want to open this not directly over the site of the present depression and probable adherence to the cortical surface, but to one side. Also I must avoid the sinuses. I pick a point here where it is safe and begin to open the skull. On account of the character of the pathology, we will not use a mechanical saw, as we do not know how extensive the adhesions are. It is, therefore, better to use the hand trephine. This man is colored and, like all colored men, has a reasonably thick skull. My bone button is loose and can be lifted out with the trephine. As one progresses with the trephine it is wise to sound the depth of the cut with the blunt end of a needle, to make sure that the dura is not being injured. The first valuable sign as the trephine sinks in is the appearance of the blood as the diploëtic vessels are opened. However, some skulls have little or no diploë and this finding may be lacking. An experienced hand can use the hand trephine and completely loosen the button and then lift it out with the trephine, as I have done here, without endangering the dura, so keen does the sense of resistance to the instrument become after performing repeated craniotomies. Now with the De Vilbiss we can drill around this depressed portion. I want to find a place for an opening where the dura is not adherent both to the cortex and to the temporal bone. The operation is both for a decompression and relief of the cortical adhesions. I find that there are some adhesions between the pericranium and dura as it comes down along the edge of the skull. That must be stripped off without interfering with the cortex. The dura has remarkable powers of regeneration. After we open it for a decompression we find it grows over, no matter how widely it is slit up, grows over very rapidly, and covers almost any defect in a very short time. If you have occasion to open a craniotomy within a short time after the original operation you will find this to be true.

We are going to make a fascia lata transplantation here. Dr. Andrews has very kindly taken out the fascia transplant that we are going to use. We expose the cortex and then take this flap of fascia and place the fat side down toward the brain, and in this way we hope to avoid subsequent adhesions. I say hope, because it is a hope, but it works quite successfully in most cases. Whether it is wise to trim the cortex in the involved motor area or not is a disputed point. I have operated on several of these, and I have never trimmed off the cortex, and some of them have been successful.

I might say a word to you about the administration of bromids in head cases. In traumata to the head where there is a cortical laceration, even if it is only slight, or even where a fracture is suspected or proved, it is far better to start the patient very quickly on bromids—30 grains four times a day is sufficient dosage. In connection with the bromid treatment let me also urge upon you the great therapeutic value of repeated lumbar puncture. Besides relieving the intraspinal pressure temporarily, at least with a diminution of cortical edema, it has another purpose. If there is a basilar fracture with bloody cerebrospinal fluid, the hemoglobin contained in this fluid is a distinct cerebral irritant, and the withdrawal of bloody cerebrospinal fluid lessens the danger of epileptic results from that source. In war surgery that is considered quite important, although the complication of epilepsy following gunshot fractures of the brain and skull is really rare, much rarer than we think. The English Government has gone into that point rather carefully, and analyzed some 1200 to 1500 cases with that point in view, and they found that the number of men developing epilepsy following head injuries was only 4 or 5 and sometimes 6 per cent. They were all amenable to cure or control by the early starting of bromids, so patients who show any tendency to epilepsy should be put on bromids as soon as they get into the hands of the medical officer, and then they do not develop *the epileptic habit.* The bromids do not need to be kept up indefinitely, simply while the patient is having convulsions and for about three weeks thereafter in diminishing doses.

I am pulling up these sutures which I put into the dura without puncturing it completely. I am now through onto the cortex. I am going to trim away some of this dura. Beneath it is found the cortex which I do not care to injure. It is not wise to sponge the cortex under any circumstances if one can avoid it. We have now the bony edge, part of which I will take off with this forceps. I do not find any adhesions between the cortex and the dura, which bulges slightly. I am going to free some of that bone below further into the temporal fossa. The brain rises and falls with respiration, but does not seem to pulsate. We will wash this blood off with normal salt solution so we can see what we are doing. There is some dural and diploëtic hemorrhage, which, of course, the scalp tourniquet will not control. Perhaps when we get it clean we will see it pulsate. That cortex is not adherent, as we have been able to demonstrate. I can pass my director completely under the dural edge. Here is some old thickened dura and pericranium. That is where the pericranium has come down over the edge of the bone and grown to the dura. Although this pericranium has grown down and is adherent, when we opened the dura we failed to find any adherence to the cortex. I do see some edematous cortex, but nothing of any gross pathologic importance as far as I am able to tell.

We will take this flap of fascia lata and put the fat side down. I am going to tack it there slightly under the edge of the open bone. It acts in two ways. It will act as a hemostatic to control what little hemorrhage we are getting from the diploë and as a means of preventing the formation of adhesions. It is not necessary to suture it all around. The operation has provided a relief of pressure, a relief of bone and dural pressure, by the removal of the old adherent pericranium and dura and the application of the fascia-flap over the denuded area. The scalp will be sutured over the opening without any drainage.

III. DECOMPRESSION FOR HYPOPHYSEAL TUMOR

You just saw me operate on a patient for cerebral decompression. I have another one at whom I would like to have you look. This man came in with a diagnosis of hypophyseal tumor. To arrive at any diagnostic conclusion we must consider the following points in his history: Prior to four months ago he was well, then his eyes became weakened, his vision was blurred, and a few weeks later intense headaches, usually occipital, developed. These headaches were continuous. He began to see double, and laying all the disturbance to his eyes, he had glasses fitted, with some relief of the headache but none of the diplopia. At times he experienced a sudden desire to urinate, and occasionally lost some of the urine involuntarily. Also in severe attacks of headache he would vomit. His venereal history revealed a chancre twenty years ago. Examination showed a slight ptosis of the right upper eyelid, right oculomotor and fourth-nerve paralysis, the muscles of the left eye being normal. The pupils, although regular, reacted very sluggishly to light and not at all to accommodation.

Dr. Brown's report on April 9th states that for the last six days the right upper eyelid has almost completely lost its power of elevation, the left retaining about one-half power. All the extrinsic muscles of both eyes were paralyzed except the right abducens and the right and left superior oblique, so that wheel motion inward is preserved. *The right visual field is typically gone in the temporal half for form, white and red. No essential changes in the nerve head.*

A roentgenogram on March 19th showed no distinct evidence of brain tumor, although there was loss of the usual clear detail in the region of the sella turcica, probably pathologic. A later exposure (April 10th) showed the sella turcica much eroded, particularly in its posterior portion, and there was distinct indication of pituitary tumor.

The headache, optic atrophy, bilateral hemianopsia, roentgenologic changes in the region of the sella, and the threatened blindness indicated surgical decompression at least. He had been on vigorous antispecific treatment for some time with no benefit. Clinically, he had evidence of paralysis of the right third and fourth cranial nerves, sixth left cranial, with the corneal reflex gone on the right side. The fifth nerves were evidently not involved. Hearing was equal on both sides and deep tendon reflexes normal.

The skiagrams were not positive by any means, but by close study of them, after taking several pictures, we were inclined to think that the hypophyseal disturbance was causing the increased intracranial tension. His headaches were very bad, and before we could attempt removal of the hypophyseal tumor it was thought a general decompression was advisable to improve his condition and to get him into shape for the more serious operation.

In a *decompression of election* the best site is the temporal region for obvious reasons. There the bone is thin, the temporal fascia is very accessible, and we have the advantage of using the temporal muscle. This operation was done in accordance with the type of subtemporal decompression with which we are all familiar, and was probably first brought out by Cushing some years ago. The choice of incision in a decompression of election is not necessarily the flap incision, such as we made in the previous case, a typical horseshoe, but perhaps a direct linear incision, such as you see here. Through such an opening you can do a decompression and not make a long noticeable scar.

The preparation of the patient involves the application of an elastic ligature over the prepared scalp and a sterile towel. Heavy rubber tubing is passed around the occiput. It may be pushed down slightly over the lower portion of the forehead.

By bringing that down tightly over the towel one can get very efficient hemostasis. In the other case it was not good. In this case and in another one I will show you we used no hemostats on the scalp incision. By means of that ligature we can cut down about as low as the level of the external orbital protuberance. That is low enough to permit one to tie the middle meningeal artery, either its anterior or posterior branch or its main trunk. By a simple incision which is made *right through the towel*, as I did this morning, one exposes the field and keeps it sterile (Fig. 262, 1). The towel is simply retracted with the other tissues or turned down with the flap if you use the horseshoe opening. In the operation of election for decompression we prefer to go through this portion of the bone (indicating) on account of its thinness, first of all, and, second, because we have here the muscle which will act as a covering after the decompression is performed. Consequently, our incision is made with a heavy stroke, which goes through the scalp and also through the temporal muscle, and the very first cut of the knife gives one an opening something like that (indicating). Then by means of a trephine an opening is quickly made, the bony tissue is taken off, and the dura is exposed (Fig. 262, 2). When the bone is removed we may have an area something like this (indicating). There is that much bony defect. That can be as large as we wish to make it. No true decompression of the brain can be made *unless the dura is opened*. It must be split, cut away, and removed entirely. When this is done, the cortex of course not being touched and the middle meningeal not being divided, we then, instead of resuturing the dura, leave it off, and cover over the cortical bulging that occurs when there is increased intracranial tension by suturing the fibers of this split muscle just the same as we suture the abdominal muscles in a muscle-splitting operation for appendicitis (Fig. 262, 3). That gives a muscular covering over the defect. That muscular covering is better than a fascial covering because the muscle takes on strength and resistance in accordance with the amount of physiologic requirement put on it. Over this muscle we are able to close our scalp incision and get a very quick healing.

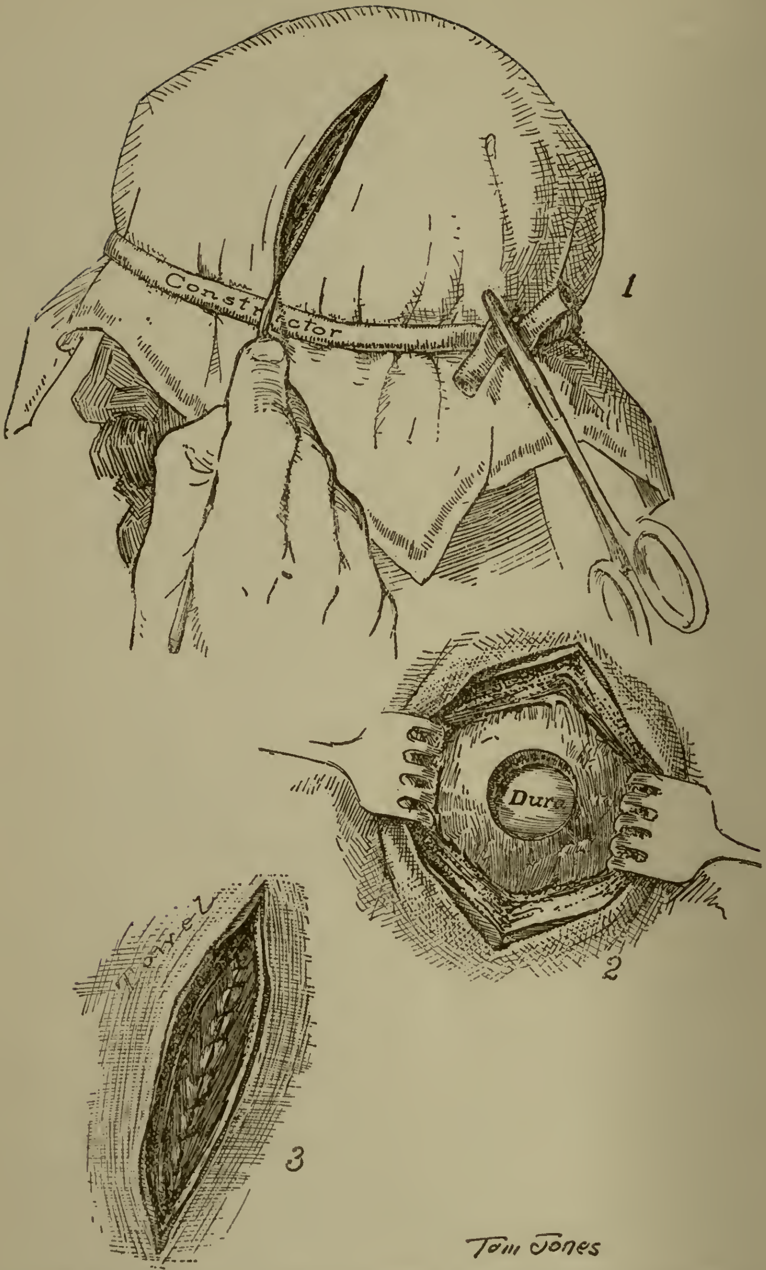


Fig. 262.—Case II: *1*, Mode of placing constrictor and incision through sterile towel. *2*, Button of bone removed, dura exposed. *3*, Suture of incision in temporal muscle.

It is now two weeks since the operation, and you see the scalp is completely healed and here in the temporal region is the bulging cortex. One can, by close inspection, see the pulsations, and by palpation feel the denuded bone and the softened mass bulging beneath the temporal muscle. Clinically, this man has made considerable progress. His vision is not restored by any means, because one eye was quite blind. His headaches have much improved and he feels somewhat better. Possibly in the course of a few weeks his condition may warrant an attempt to remove the hypophyseal tumor either by an intracranial operation from above or a transnasal operation from below. He has none of the characteristic hypophyseal findings; no evidence of acromegaly. His jaw is not enlarged; his feet and hands are not enlarged. We also find on careful examination that his sugar retention is normal, so that the case is one of dubious diagnosis, and all that we can say definitely is that there is increased intracranial pressure with headaches and bilateral hemianopsia, which clinically seems localized from a hypophyseal origin.

IV. OCCIPITAL DECOMPRESSION FOR INCREASED INTRACRANIAL TENSION

A second brain case is of a different type. This man came into the hospital almost blind. Examination of the eyes showed that the disks were pale, somewhat edematous, but there was no true optic atrophy present. Of course, you understand that Wassermann examinations were made. One was slightly positive and two or three were negative. We have been having some trouble with our Wassermanns in the last three months. We have a great many done here, particularly on the eye and nervous disease services. Recently, I think for three or four months, we have had practically all negative Wassermanns in the eye service, so Dr. Brown has been checking them up by submitting the specimens to other laboratories. In almost every case they have been confirmed, but in this patient Dr. Nicol, of the Presbyterian Hospital Laboratory, found a positive at one time, none of the others having ever shown that reaction. The history was that he had a severe trauma to his head in February of this year. The skiagram shows a slight depression at the junction of the parietal and occipital regions, which might be the cause of an increased intracranial pressure and ultimately cause an optic atrophy. The eye surgeon decided, on account of the immediately threatened optic atrophy, that we should investigate the condition very thoroughly. Consequently, we submitted him to a decompression.

This decompression was done in just the same way as the previous one, which I have described to you; with the same technic, except that it is in a different portion of the skull. One must bear in mind, of course, the location of the sinuses and the various important anatomic parts of the brain, but, as far as the mere bone is concerned, that type of operation fits almost every craniotomy. When we opened this skull we found at this point (indicating) the evidence of a depressed skull fracture, very slight in extent, with a dural adhesion which joined the cortex. It was over the occipital lobe, and if you observe closely you may see here the pulsation of the brain at the point where the skull has been removed. An occipital decompression was done about 1½ inches in diameter, circular in form, and the cortex was exposed and left bare. No attempt was made to put in a covering of fascia and fat, as we did in the first case, nor was the dura left sutured or even lying in approximation. As I said before, the dura regenerates very quickly and covers over the cortex quickly also without forming an adhesion.

This man has had some improvement. He has long been on antispecific treatment without any general effect. Since the operation his eyes have become worse, that is, there is now a distinct white optic atrophy, which is probably incurable. His headaches have improved. Yesterday he told me he had absolutely no headache. There are no peripheral findings in the way of paralyses, and, although we have not saved his vision, possibly we have done some good and have kept him from more serious cranial complications.

NOTE: On May 26th, thirty-six days after the decompression, Dr. Brown reports that vision has improved from total blindness to the counting of fingers at 3 feet.

V. PERFORATED GASTRIC ULCER

In connection with what Dr. Baker, who is intern on our service, told you about the use of methylene-blue in perforating gastric ulcer, I wish to show you a case of perforated gastric ulcer. This man had gone four and one-half days from the time of perforation to the time of operation. Before the operation we gave him methylene-blue, but I will speak about that later.

First of all, in the symptoms of perforated gastric ulcer it is not so difficult to make a diagnosis when you get the case very early. You may recall the article by Dr. Gibson last year in which he reported some 30 cases with very low mortality—I think it was 40 per cent. In the histories of those cases you will find that he got them very early, within a few hours. Why we do not get them so early in Chicago I do not know, but it is every one's experience, as far as I know, particularly in this hospital, that the cases are of several days' standing before they ever come in. I operated on one duodenal ulcer that had perforated eight days before, which, very fortunately, made a recovery. This man is the fifteenth case of acute gastroduodenal perforating ulcer that I have operated on, the mortality averaging about 50 per cent. The symptoms of ulcer cases are, of course, not so difficult to describe. The pain is very severe and stabbing in character. One patient, having the perforation about 10 o'clock at night while lying on the couch, said the pain was so sudden and so severe that he was literally thrown off the couch and rolled over on the floor in agony, unable to get up. One working man had an acute perforation while rolling a wheel-barrow containing a load of castings. The case went to court after his death, his family saying that the ulcer was caused, or at least caused to perforate, by the fact that he was wheeling a wheel-barrow. In the face of all our arguments that the man must have had the ulcer for weeks before it perforated, the court awarded the family something like $3500 because the perforation occurred while he was wheeling a wheel-barrow instead of at home after supper, as it usually does.

When the peritonitis has started and the extravasation of the stomach contents has taken place in the first eighteen or twenty-four hours the symptoms are well marked. There is sharp pain, tenderness, and vomiting. On the third and fourth day when these cases come into the hospital these symptoms are less pronounced. This man when he came in had no epigastric pain. There was some rigidity in the epigastrium, but he had more or less rigidity all over the abdomen. It was impossible from the standpoint of physical examination to localize a sharp point of tenderness in the epigastrium. You will find in these cases that there is more tenderness down in the groin and in the iliac fossa. Why? Because the peritonitis is spreading down and down, and we have a *progressive peritonitis*, a condition resembling an appendicitis, which gives symptoms of sharp tenderness and pain localized in the lower part of the abdomen, and it is on this account that so many of these cases, after having gone four or five or more days, enter the hospital with a diagnosis of acute appendicitis. That is just exactly what was diagnosed here, and I have not the slightest bit of shame in telling you that I myself thought the man had acute appendicitis. I have opened two or three of them that way. We found he had more localized tenderness in the iliac fossa. In the event of a slight temperature of 101° F., with a moderate blood count, with a history of vomiting and a sudden onset of pain, one is liable to think the patient has an acute appendicitis, probably with the formation of an abscess that ruptured. Consequently, he was operated on. We considered a gastric ulcer after going over the symptoms, and finally decided to make an opening and prove or disprove the appendicitis. That was done, and when we opened the abdomen we found that the peritoneal cavity was full of free pus and other material which poured out profusely. Of course, it takes one just about a second to decide that it is not an appendicitis. While it looks like abscess material, there is absolutely *no odor* when it is a gastric ulcer. If there is an odor, it means that the colon bacillus is present, and you know you are dealing with the bowel or with the appendix. When there is no odor, you can be further helped by having some *sterile litmus-paper*, and on testing the material from perforated gastric ulcer one gets an acid reaction. That proves beyond a shadow of doubt that you are dealing with a perforated stomach ulcer.

We made a midline opening higher up, and because we had used the methylene-blue we came at once to the perforation. There was the blue spot sticking right out in the field. There was no manipulation of the stomach or bowel. It was impossible to close it by means of a purse-string. It was simply lapped over by stitching and drained. I never do a gastro-enterostomy in the face of a perforating gastric ulcer. Some men do. It is done here in the hospital, but I never could see the reason for it. It seems to me that we should get in and out quickly and do as little harm as possible. The pus is relatively sterile, but the abdomen is full of stomach contents, and it seems to me there is a strong indication for free drainage. This case was drained, with a simple closing over of the perforation. Rectal feeding was instituted for a few days, and then the patient was started on ulcer diet of milk and cream. He has reached the state where he gets a little bouillon. He is making a good recovery.

We have adopted the routine use of methylene-blue in aqueous solution prior to operation on suspected ulcer perforation. It should be administered not more than one-half hour before incision is planned. By the time the stomach is exposed, even in the absence of gastric movement or peristalsis, the few ounces administered will have penetrated to every corner of the stomach, and seepage out of the hole into or toward the peritoneal cavity will have followed. We do not wish to soil or stain the peritoneal cavity with the blue—we merely wish to find the hole. When the solution is given too long a time before operation leakage will soil areas surrounding the ulcer, which will not stand out so beautifully as it otherwise would. When the ulcer is on the posterior wall, and after opening no evidence of the color can be found on the anterior stomach wall, the surgeon must be sure the lesser peritoneal cavity is negative before he can completely eliminate perforating ulcer. I trust this method of ours will come into universal use; it saves time and manipulation of pathologic tissues.

CLINIC OF DR. EDWIN W. RYERSON

Chicago Policlinic Hospital

TENDON TRANSPLANTATION FOR RELIEF OF PARALYSIS FOLLOWING ANTERIOR POLIOMYELITIS

Summary: A boy with marked contractures as the result of an attack of poliomyelitis four years previously; principles of treatment in infantile paralysis—the restoration of power to weakened muscles; methods employed; radical treatment not advisable within two years of the onset of the disease; technic of the transplantation of the biceps and semitendinosus into the tendon of the quadriceps extensor.

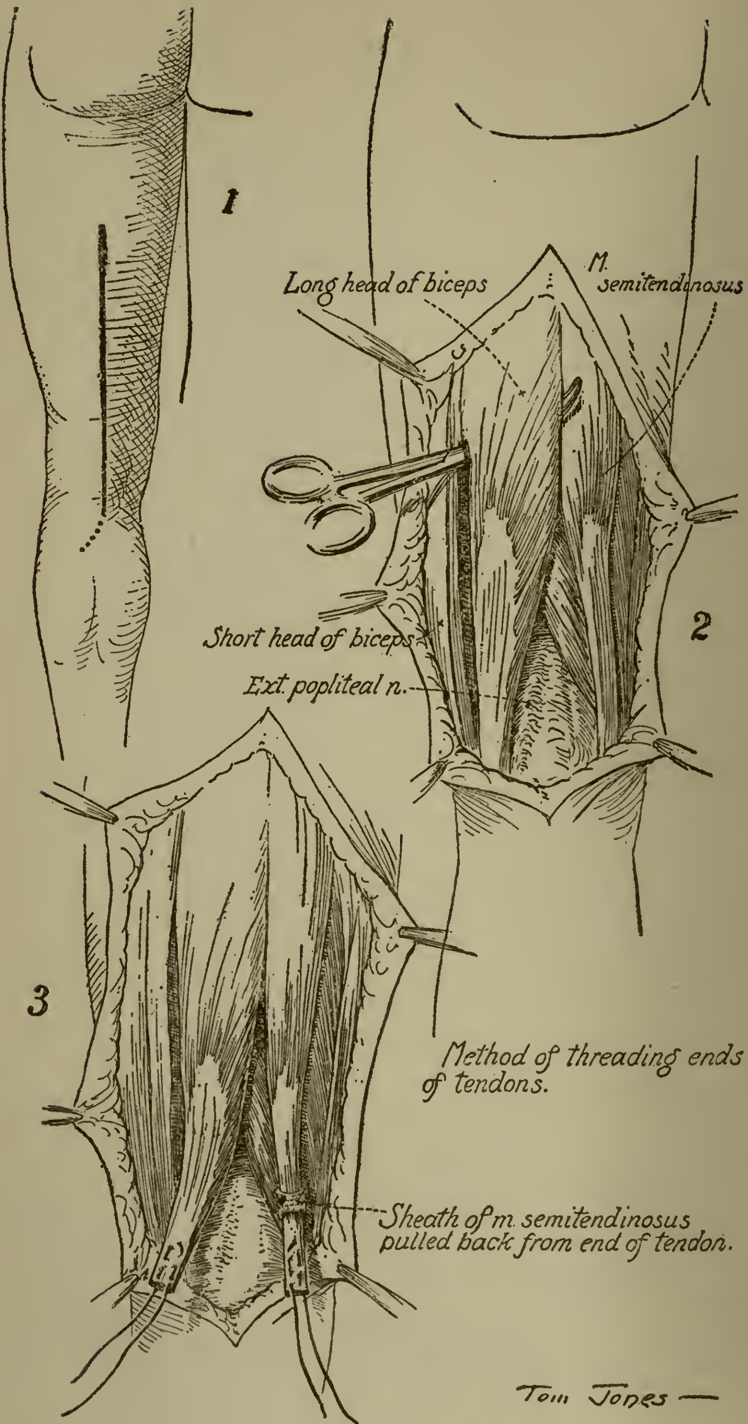
This operation is a tendon transplantation for the relief of paralysis following an attack of anterior poliomyelitis four years ago. Work of this kind is not advisable unless at least two years have elapsed since the onset of the disease, because improvement in muscular power and function may take place up to that period by the use of non-operative measures. At the end of this time it is proper to examine the patient with a view to determining the further treatment best adapted to the individual case. Some patients have so complete a flaccid paralysis that practically nothing can be done except to use braces and crutches. Others have so mild a paralysis that muscle training will give excellent results. Between these two extremes are many individuals who have unimpaired power in some muscles and total weakness in others. If these groups happen to be natural antagonists, the result will be such an imbalance of power that contractures of the healthy muscles are certain to occur, with the production of contracture-deformities. Such a case you see here.

This seventeen-year-old boy has complete paralysis of the quadriceps extensor of both thighs, so that he is unable to extend the legs at the knees. His flexor muscles, the powerful hamstrings, are unaffected, and they have gradually contracted until the knees are flexed up beyond a right angle. He is unable to walk, and has spent the last two years sitting in a chair or lying down. Three years ago the legs were straightened at the Presbyterian Hospital, but soon after the plaster-of-Paris splints were removed the contractures returned in spite of the use of steel braces. Both feet are in very satisfactory condition and require no attention, since they are reasonably stable and not deformed, and are capable of weight bearing.

It seems probable that the boy will be able to walk if the legs can be straightened and if he can be given control of the knee-joints. In addition to the severe contractures of the knees the left thigh is flexed upon the pelvis nearly to a right angle, owing to the contracture of the tensor fasciæ latæ and possibly of the deeper structures. What shall be the plan of treatment? If we simply straighten the legs and do nothing else, the deformities will return when the casts or braces are discontinued, precisely as happened three years ago. The boy does not want to wear braces all his life if he can possibly avoid it. Can we not supply power to the paralyzed quadriceps extensors by utilizing some other strong and healthy muscles? The boy has three large and powerful hamstring muscles, the semimembranosus and semitendinosus on the inner side of the thigh and the biceps cruris on the outer side. If we transplant two of these to the front of the thigh they will almost certainly furnish some active power for the extension of the leg. Also, their deforming action as flexors of the knee will be removed, and the tendency to undue flexion will be greatly lessened. It has been found advisable in most cases to make use of the biceps and the semitendinosus, leaving the semimembranosus alone to act as a flexor. Occasionally the semitendinosus seems too small or too weak to be transplanted, and in such cases the semimembranosus is used.

The principle of treatment in infantile paralysis must always be to supply power to the weakened muscles whenever it can properly be done. During the first two years after the acute attack muscle-training, massage, and perhaps electricity (the value of which is very doubtful) are used to develop whatever power may remain in the affected muscles. Braces and splints are applied if necessary to prevent deformity or to aid locomotion. After the two-year period radical treatment is advisable in suitable cases. As a rule, the more deformed the case, the more brilliant will be the result, except only the deformities of the spine.

The patient before us today is hideously deformed. His legs are absolutely useless, and are drawn up almost to the extreme limit. His left leg will be operated upon first, since it is contractured at the hip as well as at the knee. The best operation for the hip flexion is that devised by Robert Soutter, of Boston, and is done as follows: An oblique incision is made just below the anterior superior spine of the ilium and parallel to the crest of the ilium. The cut is about 3 inches long and it is carried down to the periosteum. With an elevator the periosteum is pushed downward from the anterior superior spine, carrying with it the origin of the tensor fasciæ latæ. Some strong bands of contracted fascia can usually be felt running backward and upward, and these can be divided safely. You can see that the thigh can now be extended about 20 degrees farther than before, but this is not sufficient. We examine farther inward, toward the groin, and find that the sartorius muscle is too tight. This is pushed and cut with the elevator, and the thigh can now be straightened out still more. Even this is not enough, and we must go deeper. The rectus femoris arises from the anterior inferior spine of the ilium, and I can feel that it is tense and resistant, so I pass a Kocher director under it and cut it from its origin. The incision is now sewed up and the boy rolled over on his right side, so that we can get at the back of the thigh. A very long incision is made in the middle of the back of the thigh, extending from the level of the head of the tibia upward almost to the tuberosity of the ischium. It is a grave mistake to attempt this operation through too short an incision. The skin and superficial fascia are dissected up and pulled aside by retractors. The biceps muscle and tendon can readily be seen running along the outer side of the popliteal space. The fascial sheath is split, and



Method of threading ends of tendons.

Fig. 263.

the muscle fully exposed from its insertion into the head of the fibula, upward 7 or 8 inches. It can now be seen that the lateral (outer) portion of the muscle is made up of long bundles of fibers running directly upward to the tuberosity of the ischium, while the lateral portion is composed of shorter fibers running diagonally inward and upward to the shaft of the femur, like the fibers of a goose-quill reversed. These latter muscle-fibers form the short head of the biceps and take origin from the shaft of the femur. This part of the biceps is not so useful for transplantation as is the long head, and we are going to separate the biceps into its two component parts and transplant only the long part. The common tendon is broad and thin, and it requires a little care to dissect it cleanly into two halves, but, as you see, it can readily be done, and the long head is now completely isolated down to the fibula. By keeping in the fascial sheath, we avoid injury to the external popliteal nerve. It is very important to cut the tendon as low as possible in all cases where the leg is permanently flexed, because it must be sewed into the patella with only a slight amount of tension to insure good union. This boy's leg is so much flexed that we may have to lengthen the tendon by artificial means to enable it to reach the patella. A strong kangaroo-tendon suture is now woven into the biceps tendon, starting at the distal end and weaving it in and out, going upward about 2 inches, and then going downward again and out through the end of the tendon. We can thus obtain a perfectly solid grip of the tendon and also make the tendon itself a little rounder and firmer, since it is always rather flat and stringy. The ends of the suture are now clamped with a hemostat and laid aside for the present.

The inner side of the long skin incision is now retracted, and the skin dissected up to expose the inner set of hamstring muscles, the semitendinosus, and the semimembranosus. The former is

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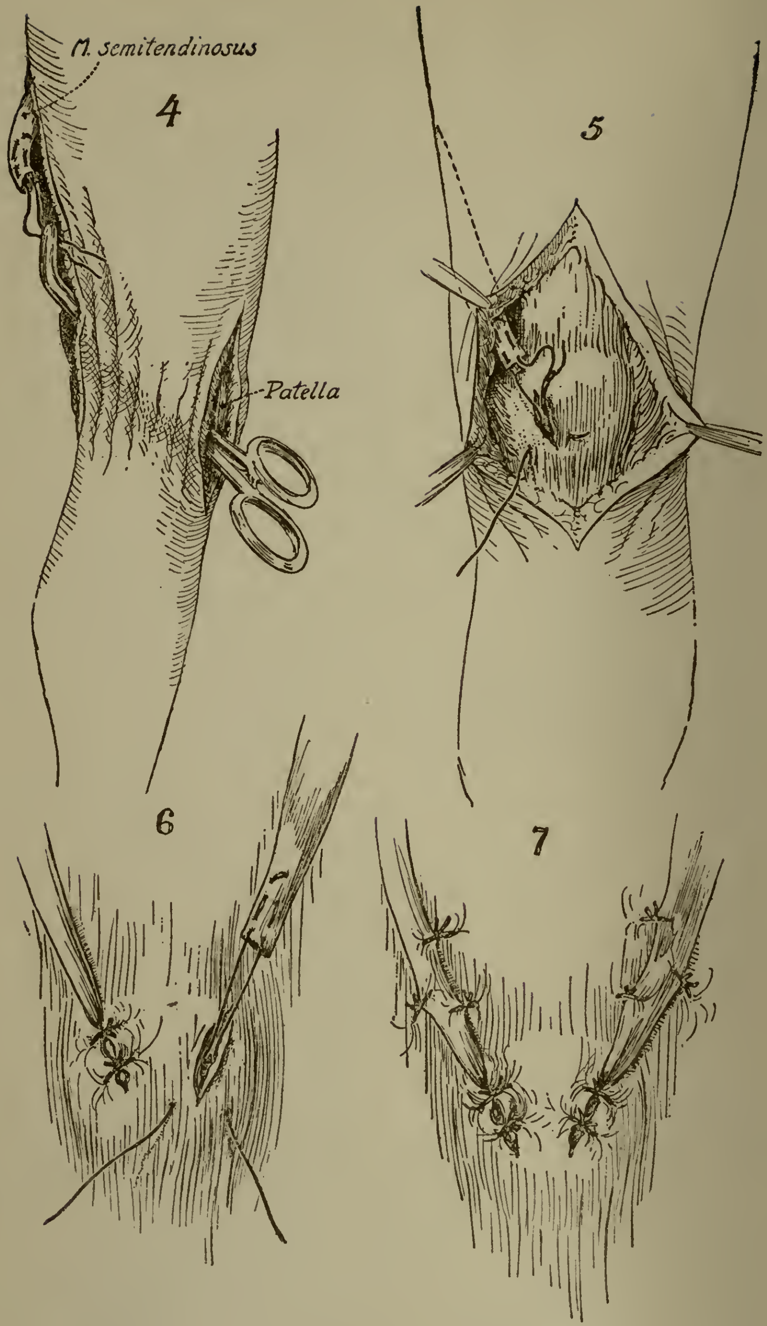
Fig. 263.—*1*, Long incision necessary. Dotted line shows additional incision if patient is large and stout. *2*, Long (ischial) head of biceps being separated from short (femoral) head. An original method of considerable value. *3*, Kangaroo-tendon sutures quilted into ends of tendons. Usually runs higher in biceps, as this tendon is thin and flat.



Tom Jones —

Fig. 264.

the one we prefer to use if it appears to be pink and healthy and of good size. In this patient it is entirely satisfactory, and we proceed to dissect it up. It lies directly upon the semimembranosus, which is a much broader and heavier muscle and tendon. The semitendinosus is a long, slender muscle, terminating, as its name implies, in a long tendon, and covered in its entire length by a very complete fascial sheath. We must carefully preserve this sheath intact, which is not at all difficult. The combined tendon and sheath are cut off low down at their insertion into the tibia. The sheath is drawn back and the tendon is threaded with a kangaroo-tendon suture, as was done in the case of the biceps. These two muscles are now ready to be transplanted. We must first try to straighten the leg, since it is very much flexed. A strong, steady pull by the assistant produces a little better position, and the short head of the biceps is evidently too strongly contracted to allow any more straightening. We must do a plastic lengthening of it by splitting it and cutting one half across low down and the other half high up. The two halves are now sutured together. The semimembranosus is lengthened by the same method, and a further attempt is made to straighten the leg. As you see, the position is much improved, but the leg is by no means straight enough. We can feel a strong cord in the middle of the popliteal space which prevents further straightening. Blunt dissection shows this to be the internal popliteal nerve, so we will make no further attempt to straighten the knee at the present time. After the wounds have healed we shall apply a Buck's extension, which will gradually and safely straighten out the leg in a week or ten days. (This was done and the leg was straight in two weeks.)

The patient is now rolled over on his back, and an incision is made from the lower end of the patella, running straight upward about 4 inches. The skin and fascia are dissected back and the edges of the wound retracted. A heavy, curved pedicle forceps

Fig. 264.—*4*, Pulling tendon forward through wide channel in subcutaneous fat. *5*, Kangaroo anchor-suture inserted through periosteum and bone. *6*, *7*, Reinforcing sutures of chromic catgut.

is thrust downward and backward just under the skin, in the subcutaneous fat, emerging in the posterior wound near the biceps tendon. The forceps is opened and shut during its passage, so as to tear a wide tunnel just under the skin. The kangaroo-tendon prolongation of the biceps is seized by the forceps and pulled up through the tunnel, bringing the biceps with it. The tunnel must be made on a long slant upward toward the ischium, so that the muscle can pull in as direct a line as possible without having to go around too sharp a corner. The same thing is done on the inner side of the thigh and the semitendinosus is brought out to the patella. As you see, the biceps is too short to reach all the way to the patella unless a great deal too much tension be put upon it. There is a space of 1½ inches to be bridged over by the kangaroo-tendon prolongation. We could readily take a piece of fascia lata, roll it up like a tendon, and suture it to the biceps and to the patella, but this is usually not necessary. For distances under 1 inch the kangaroo-tendon seems to be sufficient to make a firm union, although it is possible that some of the few failures in this operation may be due to this technic. In ordinary cases without much flexion deformity the tendons are amply long to reach the patella.

A longitudinal cut is now made in the periosteum of the patella at the outer side, and the two strands of the kangaroo-tendon, threaded into strong curved needles, are passed into the slit, in diverging directions, forward and outward, through the strong periosteum and fascia, and tied. This gives a very firm insertion, and it is probable that tendon tissue or connective tissue grows along the suture so as to make a good union. Besides this anchor-suture to the patella, we put in several interrupted chromic catgut sutures to fasten the biceps tendon to the vastus externus and the quadriceps tendon. This gives excellent fixation.

We now take up the semitendinosus, and find that it is long enough to reach to the patella with only a reasonable degree of tension. A slit is cut in the periosteum of the patella, as before, the kangaroo sutures passed in opposite directions through the periosteum and fascia, and as the sutures are tightened the semitendinosus comes directly into the slit. The sutures are tied, the tendon is sewed to the vastus internus by several interrupted sutures, and the tendon sheath is pulled down along the tendon as far as it will go and secured by a stitch or two. This small detail of preserving the sheath insures against the formation of adhesions, and is well worth remembering, although the adhesions that sometimes form in the case of the biceps (where the sheath cannot be utilized) are not of very great importance.

The incisions in the skin are now sutured with continuous catgut on a long straight Keith needle, and the leg and thigh are incased in a plaster-of-Paris bandage. At the end of six weeks, or even less, active motions and muscle-training are begun.

In nearly all these cases the results are excellent.

CLINIC OF DR. CARL BECK

NORTH CHICAGO HOSPITAL

PENDULOUS ABDOMEN: CURE BY REMOVAL OF EXCESS FAT AND OBLITERATION OF VENTRAL HERNIAS

Summary: Indications for the operation; technic; best to leave the umbilicus unless there is an umbilical hernia; imbrication of overstretched fascia frequently desirable even in the absence of hernia; wound closure—importance of plate-tension sutures and drainage.

AN operation which is of great value in a limited number of cases is the removal of a portion of the abdominal wall. The indication is not very frequent, but there are individuals who suffer a great deal from excessively fat and pendulous abdomens for which such a procedure may become a necessity.

One of the symptoms is a continuous, very heavy sensation over the stomach. Another symptom is backache and intestinal disorder due to the abnormal length of the mesentery. The patient at first tries belts and supporters, but after a time these cease to be of value, since they do not give sufficient support. Eventually these people find that there is no way of constricting the abdomen which will prevent a large fold of fat and skin from hanging down like a cumbersome apron (Figs. 265–267).

They also suffer a great deal from the results of the accumulation of secretion in the folds of the skin, which macerate the skin somewhat, cause itching and scratching, and the result is a dermatitis, sometimes of marked severity.

There is no doubt that patients who suffer from these symptoms feel greatly relieved after this large flap with the underlying fat has been removed (Fig. 268), and the abdomen has been thereby reduced to a size which prevents the hanging down of this apron with all its attendant discomforts.

Very often these cases are complicated by hernias, so that, a herniotomy being required, the additional removal of the skin and fat is only a part of the operation. Diastasis of the recti is often connected with this condition, although quite often diastasis of the recti is also present without superfluous fat and even in thin individuals. At times we meet such cases with intra-abdominal conditions which necessitate operation, so that while doing a laparotomy we can at the same time make

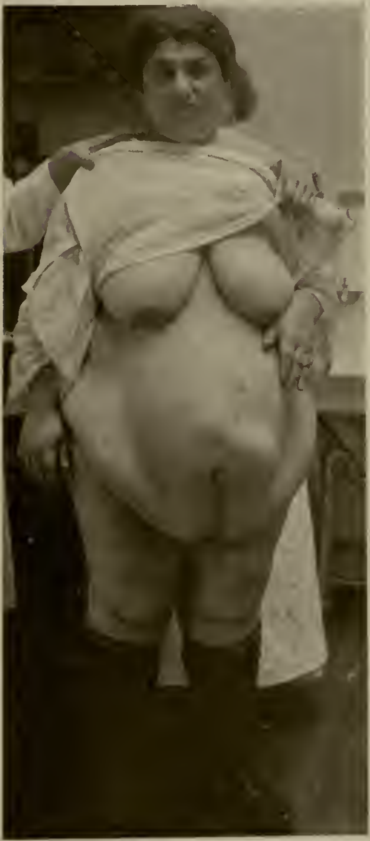


Fig. 265.—Patient with pendulous abdomen, front aspect. A large ventral hernia is visible in the scar following a cesarean section.

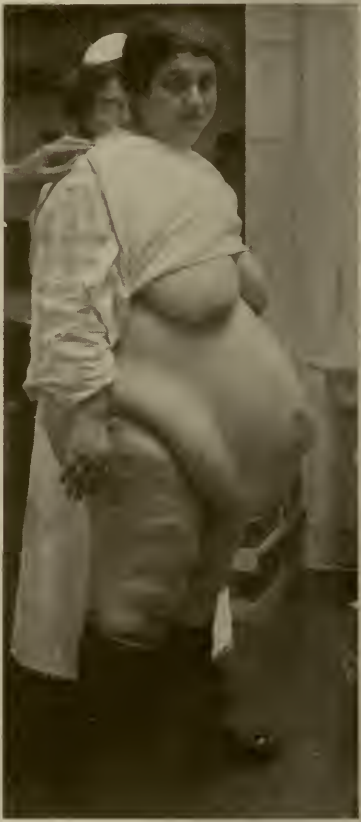


Fig. 266.—Same patient, lateral aspect.

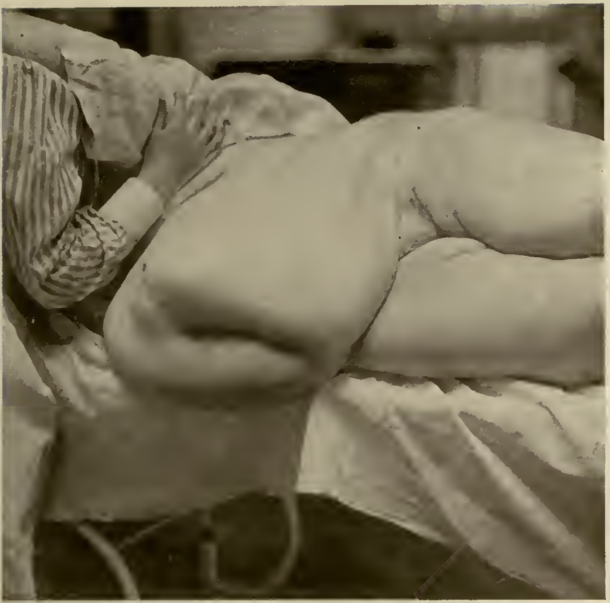


Fig. 267.—Another case with pendulous abdomen, showing large bag-like protrusion which falls over the table on lateral position, also connected with a small ventral hernia.

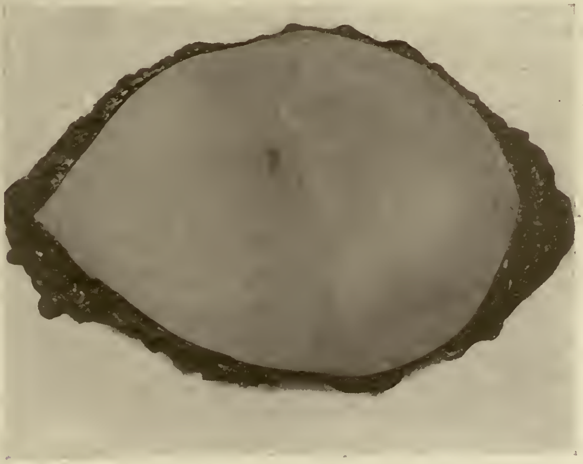


Fig. 268.—Portion of abdomen excised, showing the umbilicus in the center, which had been excised along with the fat and flap.

the abdomen much smaller. However, the easiest cases of this class in which to get a good result are those in which the operation is done purely for the purpose of removing all the superfluous fat of the pendulous abdomen.

The operation itself is not very difficult. It is more complicated if we have to deal with a hernia at the same time, as then we have to lay open a large surface of the abdominal wall, and, in case we have not primary union, we run the risk of having a worse condition afterward than before the operation. The method is simple:

We make an elliptic excision of the abdominal wall by means of two curved transverse incisions, starting from one side and arching respectively one above and the other below the umbilicus to the other side, including as much of the pendulous apron as it appears to be desirable to remove. This large elliptic piece must be dissected from the abdominal fascia. There is one difficulty in this dissection, namely: at the umbilicus the skin is very thin and has no fat, while surrounding the umbilicus there are large and thick layers of fat. When we dissect out the umbilicus, therefore, we have very unequal surfaces to unite, a surface which in the center is almost entirely free from fat, while on each side is a steep wall of fat. This makes the central union somewhat difficult and endangers the result in a way, particularly when we have to deal with a hernia in the umbilical region—a weak spot of union underneath, and on top the thin scar, lying also in that weak spot. Consequently I have made a change in the later cases in which I have performed this operation, which consists in leaving the umbilicus, especially if it is not the seat of a hernia.

The navel is demarcated by a circular incision having the umbilicus at its center, and with a radius of about $\frac{3}{4}$ to 1 inch, and the skin dissected from the same downward toward the fascia. This leaves a tube-like arrangement with a flange of skin-flap on the outside connected with the abdomen. If there is no dilatation around the navel, nothing else needs to be done. If, however, the fascia is obviously much stretched out, as in many cases, then it is incised transversely and the fascia from one side of the incision is superposed or imbricated upon the other, like the tiles of a roof. This not only strengthens the abdominal wall but also makes it less projecting. The flange of skin about the umbilicus is sutured above and below to the border of the wound, and the whole abdomen, after the entire wound has been sutured, presents the appearance of a normal abdomen with the navel in its normal position. If a hernia exists it is, of course, taken care of before the abdominal wound is sutured.

Any of the methods advocated in the text-books in regard to the cure of umbilical, para-umbilical, and epigastric herniæ may be used in these cases.

As far as the suture of the skin is concerned, we have found that the plate-suture is the best. It can be retained as long as one wishes. It is best to have tension sutures, and if properly applied they do not lead to any necrosis of the skin. The plate suture consists of silver-wire sutures tied over lead plates, and four sutures of this kind ought to be plenty to retain this very large wound in apposition until union takes place. It is very important in these cases that there should be primary union. For this reason it is absolutely necessary to ligate every little vessel before the wound is closed, and to be doubly sure it is well to leave a little drainage-tube in the outer border of the wound, so as to prevent the accumulation of secretions by affording them prompt exit. One may use a rubber tube for this purpose, or drainage by means of a few strands of silkworm-gut is applicable. After union has taken place it is important to protect the abdomen by a supporter for some time.

I shall handle the present case in accordance with the general principles which I have just outlined. This patient, Mrs. D., who weighs 295 pounds, is, however, not so fat on her body as on her abdomen. When she stands her abdomen hangs down considerably over her symphysis pubis and she has considerable pain in the upper part of her abdomen, about 2 inches above the umbilicus. To the right side of the umbilicus, above, is a hernia about the size of a fist, which protudes on coughing. We have to deal here with an epigastric hernia. Her worst symptoms appear when she stands. She herself suggests the desirability of removing a part of that large abdomen to relieve her condition.

The usual transverse incision is made. The epigastric hernia has a ring of about the size of a quarter, through which a large portion of the great omentum, adherent to a sac, is propelled and cannot be fully returned on account of adhesions. The sac is opened, the ring slightly enlarged, the adhesions to the sac severed, the omentum returned to the abdominal cavity, and the edges of the ring freshened and sutured accurately in a longitudinal direction; thereupon the navel is dissected and a flange left in the way I have already described. The umbilical region is slightly protruding; a transverse incision of the fascia with imbrication to the extent of about 2½ to 3 inches on each side of the umbilicus strengthens the abdominal wall. Plate sutures are applied and two drainage-tubes attached, one in each corner (Fig. 269).

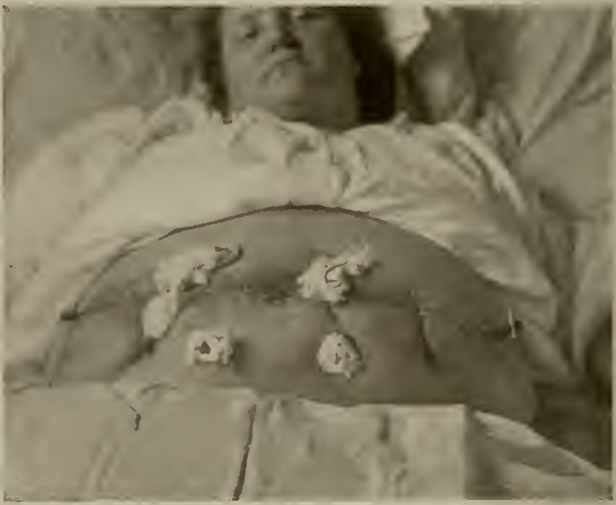


Fig. 269.—Case after operation. Plate sutures in the center. The umbilicus in this case has been retained and can be seen sutured in, in the center of the scar. On both sides are short tubes for drainage.

Note: This patient made a perfect recovery.

TRANSPERITONEAL APPROACH TO THE KIDNEY

Summary: Advantages of the ordinary posterior oblique incision; difficulties encountered in cases complicated by massive neoplastic or inflammatory infiltrations; easy, safe, and bloodless access to such kidneys afforded by transperitoneal route; operative technic.

In the course of years we grow accustomed to a certain operative technic, and because it is satisfactory we are loathe to make a change. The kidney has been removed in a more or less typical manner through a posterior oblique incision ever since I can remember. The most important reason for choosing this route is to make the operation extraperitoneal. The kidney lies behind the peritoneum, and our reluctance to invade this cavity during the operation led us to look for a route outside of the same. In infected cases where we fear an infection of the peritoneum, and in those cases in which we leave the kidney behind, as in nephrotomy for stone or abscess, where the escape of urine into the peritoneum would be fatal, we favor an extraperitoneal operation. This is also the most convenient route for drainage because, with the patient in the recumbent position, the drainage opening lies at the most dependent part of the wound.

There is, however, a certain disadvantage in this operation, a disadvantage which may mean a great deal in some pathologic conditions. It lies in the difficulty in reaching the blood-vessels which supply the kidney, especially in those cases in which there is a large tumor of the kidney with a good deal of infiltration around the pedicle of the vessels. In such instances the hemorrhage produced by the separation of the tumor through the ordinary posterior incision is so profuse that the ligation of veins and small arteries, lying deeply as they do, becomes next to impossible, and consequently a good deal of blood is lost before the pedicle with its blood-vessels is reached. This is one of the difficulties of the customary technic, especially when the incision is not very large. There are many cases in which the kidney root is not free and movable in which the indication for nephrectomy is present; cases in which abscesses have been drained, so-called dead kidney, chronic tubercular kidney, etc. Inflammatory or neoplastic infiltration around the kidney may be so dense that it is impossible to deliver the kidney or even to expose it sufficiently to allow a clamp to be applied to the vessels in the pedicle. Special clamps have been constructed for this purpose, but the vessels are better taken care of under such circumstances when they are rendered visible by the adoption of another route of approach.

Often an experienced surgeon will perform a good operation in these cases, but he is apt to have a great deal of difficulty, and often, in trying to separate the kidney, will tear one of the large vessels and produce dangerous hemorrhage, or leave portions of the kidney behind, which afterward prevent primary union and lead to persistent fistulæ.

I have used the transperitoneal method in a number of cases, and I feel that in many instances it has given me an easy, safe, and bloodless access to the infiltrated kidney which I could not have achieved otherwise. It made it possible to do every step of the operation under the guidance of the eye.

The method is simple: A long incision is made anteriorly in the nipple line, from the rib border vertically downward (Fig. 270), and the peritoneum is opened. On the right side the ascending colon is lying in front and over the middle of a large tumor of the kidney. The peritoneum lies loosely over this projecting area. The first thing to do is to wall off the peritoneum accurately, so that in case infectious material should escape, we may deal with it just as we would with any abscess in the abdomen. After walling off clear around this large tumor we pick up the peritoneum and incise it again in the same longitudinal line as high up and as low down as is necessary to expose the tumor, and dissect directly toward the center of the body on the median aspect of the kidney, separating the tissues with blunt scissors and avoiding the cutting of vessels as much as possible. We arrive at the arteries and veins leading off toward the aorta and vena cava. These vessels are grasped between two forceps or, preferably, between three forceps if possible, because leaving two forceps on the vessels and one forceps on the kidney is preferable to leaving only one forceps,

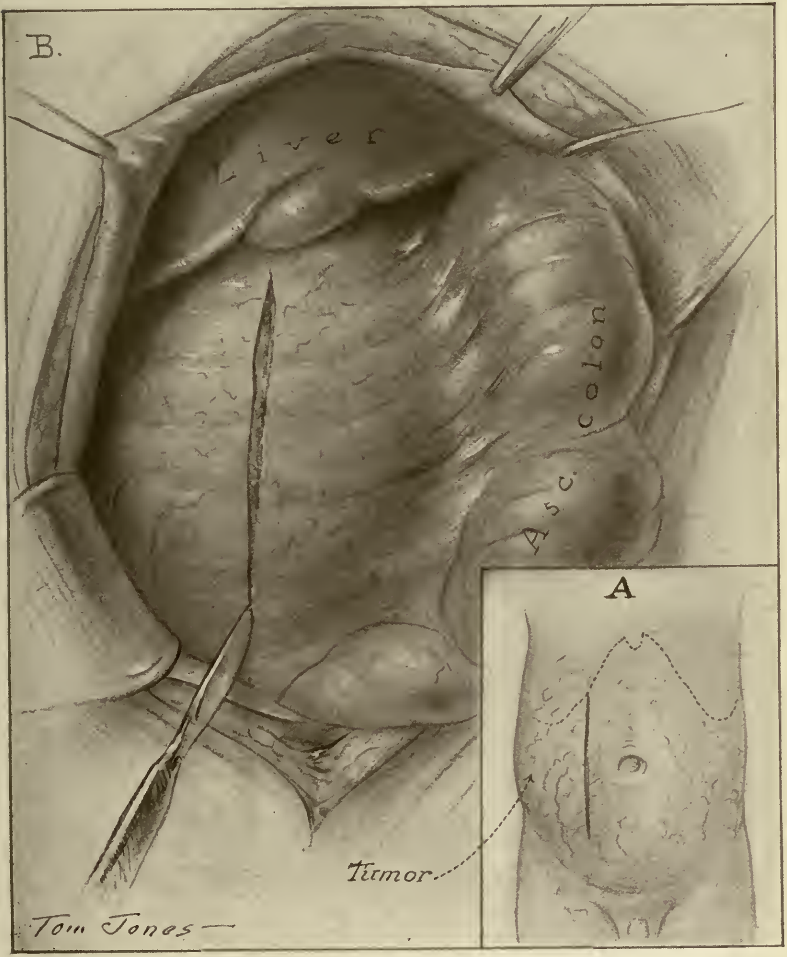


Fig. 270.—A case of renal tumor operated on by the transperitoneal route: *A*, External view of the abdomen. Note line of incision, distended veins, and bulging of the side on which the tumor is located. *B*, Abdomen opened. The ascending colon displaced medianward by the tumor. Incision is made through the peritoneum over the prominence of the tumor and it is shelled out, ligating the vessels as they are brought into view.

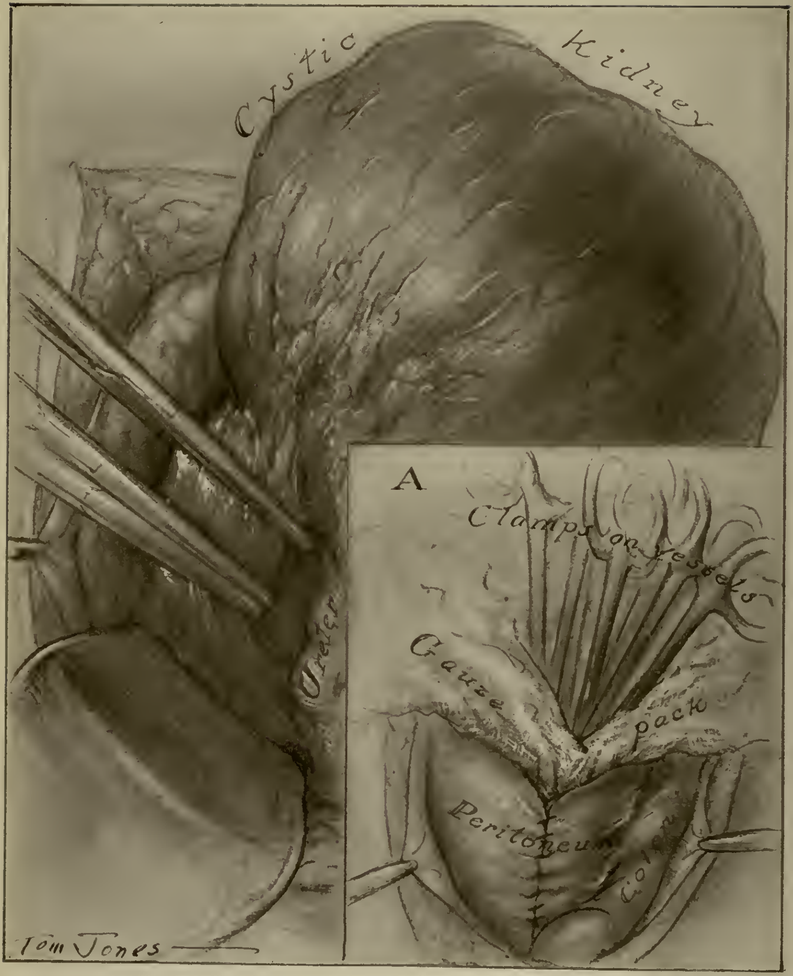


Fig. 271.—The tumor separated from its base. Note forceps on the pedicle, two on the proximal, one on the distal side, ready for ligation. *A*, The peritoneum has been sutured and the cavity filled with gauze. A few forceps have been left in this particular case on very high vessels which were venous, very delicate, and would not permit of ligation. These forceps are left for about twenty-four hours and then removed; they act not only as hemostats but as drains.

which is liable to slip off (Fig. 271). Then the ligature is placed over the inner forceps, while the outer one is still left in place, and the contents of the forceps leave enough of a stump so that the ligature cannot slip over the same. It is only in the case of the worst infiltrations where we have difficulty in placing these three forceps. Having done this, we can speedily proceed to separate the rest of the tissues, on the sides and from behind, from the capsule. It is almost a bloodless process. After removing the whole kidney substance from its bed, we find a few small arteries on which we have placed forceps during our resection, and after ligating them we drain. In the cases in which we have to drain, we can drain conveniently backward, perforating the abdominal wall through the retroperitoneal space outward, or else we can also drain forward through a pouch of the peritoneum, which we make conveniently and draw up toward the abdominal wall.

This operation has nothing new about it, but it is not practised very much, and I should recommend it in cases of tuberculosis of the kidney and old suppurative remnants of surgical kidneys, which are so often difficult to treat through the posterior incision, in which we have to work in a small space, in which we do not see very well, and in which we are liable to do more harm than when working in this way through a large anterior incision.

DIASTASIS OF THE EXTERNAL OBLIQUE SIMULATING A DIRECT HERNIA OF THE ABDOMEN AND ITS CURE

There are a number of individuals whose abdominal wall is naturally defective. When these people work at a task which involves the production of a marked increase in the intra-abdominal pressure—*i. e.* heavy lifting and straining—they are apt to produce a bulging of the inguinal region more toward the side of the body than in the usual position of an inguinal hernia, but in the neighborhood of the external ring. Sometimes this bulging extends clear down into the external ring (Fig. 272).

When we investigate the nature of this trouble, which occasionally causes the patients a good deal of discomfort characterized by a feeling of weakness and a dragging sensation in the side, we find that it is an exaggeration of a natural anatomic condition. Everyone who has operated on a large number of appendices knows that when one incises the abdominal wall to the fascia of the external oblique he often finds a place in the fascia where the fibers are separated, a sort of cleavage of the fascia. This natural cleavage is probably present in 60 to 70 per cent. of all people. Following it down to the external ring, one finds that it condensates a little toward the external inguinal ring except in some individuals, in whom it extends clear into the ring. If these people are thin and do not develop their muscles much, their abdominal wall gives way along this weak spot, and the cleavage, which is originally very small, becomes a space $\frac{1}{4}$ to $\frac{1}{2}$ inch in width, through which the underlying muscle is clearly visible (Fig. 272). This muscle being again underdeveloped or atrophied, a bulge appears at this weak spot whenever the patient stands. There is really no hernia in the true sense of the word, not even a direct

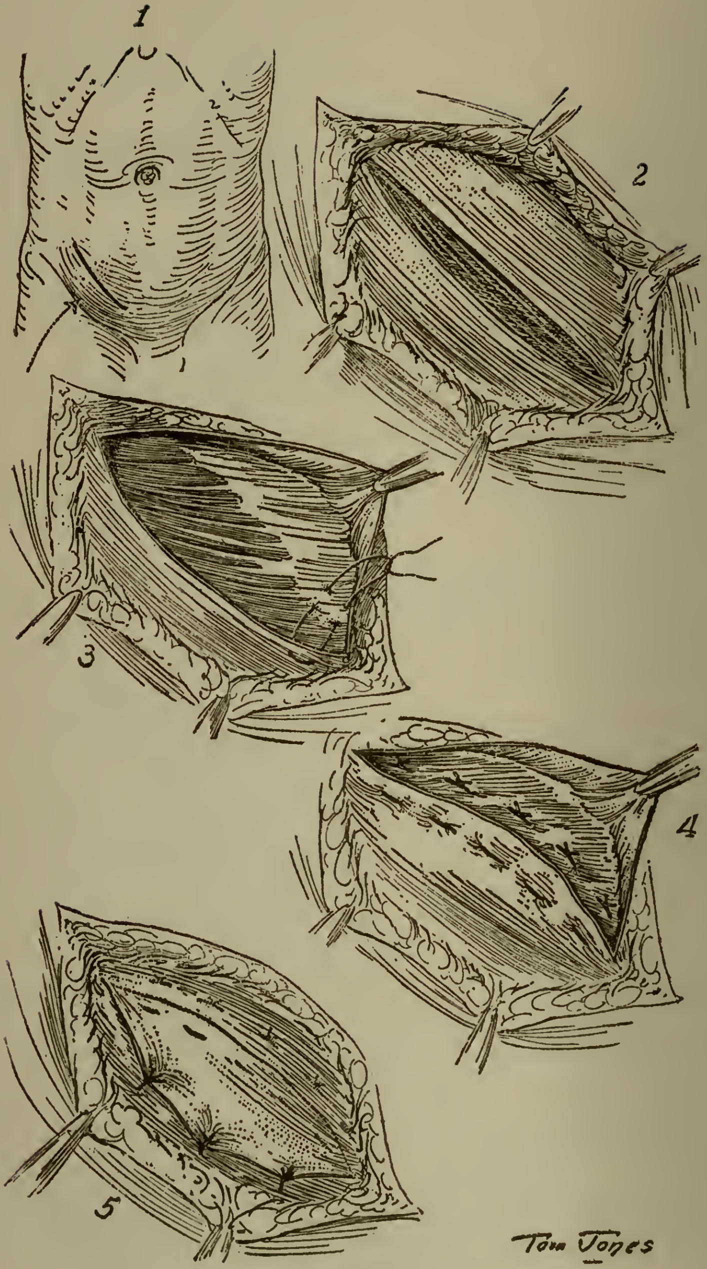


Fig. 272.

hernia, inasmuch as the peritoneum does not get into this external dilatation, but the defect nevertheless requires repair. Supporters will not do. The best treatment—with which there must be associated general hygienic measures, increase of nourishment, and so on—is the suture of the fascia by imbrication.

The accompanying illustration (Fig. 272) explains this procedure perfectly.

Fig. 272.—Diastasis of external oblique: *1*, Abdominal wall showing (arrow) the hernia-like protrusion; *2*, incision down to the fascia demonstrating the separation of the fibers of the external oblique aponeurosis, a weak spot which acts like a hernia; *3*, the edges of the split in the fascia are freed and the lower one is drawn upward and medianward and sutured to the fascia of the rectus with mattress sutures; *4*, the mattress suture completed; *5*, the median part of the fascia is then imbricated upon the lower or lateral shelf with a few stitches and the skin closed. The position of the mattress sutures is indicated by interrupted lines. They, of course, are covered by the skin and superficial fascia.

CLINIC OF DR. DANIEL N. EISENDRATH

Cook County Hospital

THE DIAGNOSIS AND TREATMENT OF COMMON DUCT CALCULI—WITH SPECIAL REFERENCE TO OVERLOOKED COMMON DUCT CALCULI

Summary: A patient who has twice previously been operated on for gall-stone disease and now presents the picture of attacks of epigastric pain, icterus, clay-colored stools, chilly sensations, and fever of the continuous type; causes of recurrence of symptoms following operations on the biliary passages; obstruction of the common bile-duct—differential diagnosis; technic of the exposure, the exploration, and the drainage of the common and hepatic ducts; great importance of adequate exploration of the bile-ducts.

The patient whom we propose to operate on today is an example of the unsatisfactory results which at times follow operations upon the bile-passages. She was admitted to my service one week ago with the following history:

She is forty-nine years of age, and states that her present illness began about one year ago with recurrent attacks of severe pain in the right upper quadrant of the abdomen radiating to the right shoulder. In July, 1916, at another hospital the gall-bladder was drained after removing a number of small calculi. After about five months she was operated upon again on account of a biliary fistula which had persisted since the first operation. At this second operation a calculus, firmly lodged in the cystic duct, and which had evidently been overlooked at the previous operation, was found as the cause of the fistula. The gall-bladder as well as the offending calculus was removed at this second operation and the wound closed about three weeks previous to her admission to this hospital. The same surgeon performed the cholecystostomy and the later cholecystectomy, and has informed me that he palpated the common duct at the second operation, but could detect no calculi. Ever since the wound of the last operation healed she has had recurrence of pain in the epigastrium accompanied by jaundice and clay-colored stools every six to seven days. The present attack of pain, jaundice, and fever has been of longer duration than any of the previous ones, and was accompanied by nausea, vomiting, and pruritus. She has had some chilly sensations, but no distinct chills. Her past and family history are negative, and the same is true of her menstrual and obstetric history. Her temperature during the week since her admission has varied from 101° to 103° F., her stools have been clay colored, and the icteric hue of the skin and visible mucous membranes has become deeper from day to day.

Examination before operation today shows a markedly icteric, poorly nourished woman. The examination of the head, neck, and thorax, aside from the icteric skin and scleræ, is negative. There is distinct tenderness over the epigastrium, especially to the right of the median line. No tumor mass or enlargement of the liver or spleen can be felt.

Before beginning our operation let us discuss why a patient who gives the history of recurrent attacks of gall-stone colic, who had a drainage of a gall-bladder filled with calculi eight months ago, and a removal of the organ on account of a biliary fistula due to an overlooked cystic duct calculus six months later, and whose common duct at this second operation was negative to palpation, should still continue to suffer from attacks of pain in the epigastrium accompanied by intense icterus, clay-colored stools, chilly sensations, and fever of the continuous type.

We may divide the recurrence of symptoms after operations upon the biliary passages into true and false recurrences dependent upon their relation to the actual reformation of calculi.

Causes of True Recurrence.—1. Reformation of calculi in the gall-bladder: (*a*) due to recurrence or persistence of infection, and (*b*) due to reformation of calculi (Fig. 273) in the crypts of Luschka.

2. Reformation of calculi in the common, hepatic, or intra-

hepatic ducts as the result of recurrence or persistence of infection.

3. Reformation of calculus in stump of cystic duct.
4. Reformation of calculus around silk ligature.

Of these, the last named does not occur at the present time, but there are reports of formation of calculi around ligatures or sutures of this material when it was employed in the early days of gall-stone surgery.

In the second group I believe that we can eliminate all except intrahepatic calculi, because the majority of the calculi found at secondary operations on the hepatic or common ducts are now believed to have been overlooked[1] at the primary operation and really belong under false recurrences.

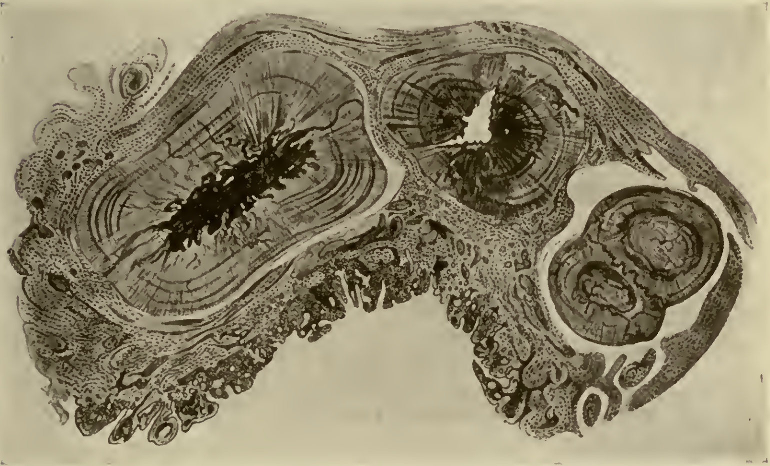


Fig. 273.—Section of gall-bladder wall showing stratified cholesterol calculi forming in the dilated crypts of Luschka (Aschoff).

It is impossible at the present time to express an opinion as to whether intrahepatic calculi when they give rise to recurrence symptoms belong to the true recurrence group, *i. e.*, are newly formed as the result of recurrence or persistence of the original infection, or are, in reality, present in such large number and so widely disseminated within the hundreds of intrahepatic bile-ducts that it is beyond human skill to wash them out after even prolonged common duct drainage. The whole subject of intrahepatic cholelithiasis is still in the early stages of evolution from the clinical standpoint, the only articles of importance being those of Beer and Lewisohn quoted in my article.[1]

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[1] See article by author on "Overlooked Common Duct Stones" in Jour. Amer. Med. Assoc., March 31, 1917, vol. 68.

Causes of False Recurrence.—The false recurrences are best divided as follows:

1. Calculi in the gall-bladder, common, hepatic or intrahepatic bile-ducts, which were overlooked or impossible to find (intrahepatic) at the previous operation.
2. Adhesions, especially (*a*) to the abdominal wall, such as occur after the older method of drainage of the gall-bladder, in which the fundus was sutured to the parietal peritoneum; (*b*) to adhesions of the stomach or duodenum to the gall-bladder after cholecystotomy or of the same viscera to the liver after cholecystectomy.
3. Chronic pancreatitis. The close lymphatic relation of the biliary tract to the pancreas is referred to later under diagnosis.
4. Carcinoma of head of pancreas. This may have been present, but overlooked at the primary operation.
5. Persistence or recurrence of infection: (*a*) in the gall-bladder (especially frequent after simple drainage); (*b*) in the common, hepatic, and intrahepatic bile-ducts. In the last named the infection may persist or recur as a chronic catarrhal or even suppurative cholangitis.
6. New gall-bladder formed in dilated stump of the cystic stump after cholecystectomy, as reported by Floercken.[2]
7. Stricture of cystic, common, or main hepatic ducts.
8. Internal or external biliary fistulæ.
9. Contraction of the ampulla of Vater.
10. Mistakes in diagnosis. The case may originally have

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[1] See article by author on "Overlooked Common Duct Stones" in Jour. Amer. Med. Assoc., March 31, 1917, vol. 68.

[2] Deut. Zeit. f. Chir., 1912, 113, p. 604.

been one of gastric or duodenal ulcer, hysteria, tabes with visceral crises, or even a spinal tumor.

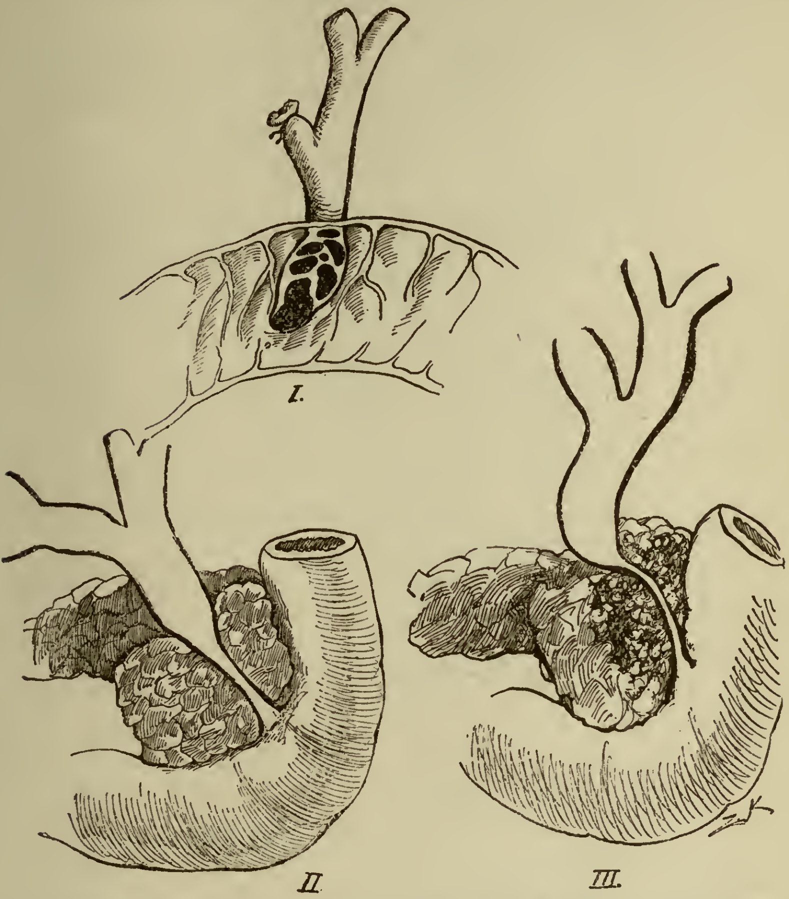

Fig. 274.—Diagrammatic views of various forms of obstruction of common duct: *I*, Large calculus found firmly impacted in ampulla of Vater with smaller ones behind it. All of these had been overlooked in this case at cholecystostomy with removal of calculi and later cholecystectomy. *II*, Compression of common duct by chronic indurated head of pancreas. *III*, Compression of common duct by carcinoma of head of pancreas.

11. Pancreatic calculus.

Under which of the groups of true and false recurrences does our case belong?

If you will recall the chief points in the patient's history we can at once eliminate all the above causes except the following:

1. Reformation of calculus in dilated stump of the cystic duct.
2. Adhesions, especially of the omentum, stomach, or duodenum, to the liver bed from which the gall-bladder has been removed.
3. Overlooked calculi or a stricture or persistent infection of the common or hepatic ducts.
4. Marked enlargement of the head of the pancreas compressing the lower end of the common duct as the result of an interstitial chronic pancreatitis.
5. Cancer of the head of the pancreas overlooked at the time of the previous operations or possibly developed in the interval.
6. Cicatricial contraction of the ampulla of Vater or its obstruction by a pancreatic calculus.

Now the salient points to be considered in making a diagnosis of this case are: 1. Previous cholecystotomy for many small calculi, later cholecystectomy. 2. Present symptoms: pain to right of median line above umbilicus, marked icterus, fever, clay-colored stools.

The symptoms point strongly to some form of almost complete obstruction of the common duct, but may be due to an infection alone.

A glance at Fig. 274 will show the compression of the common duct by the enlarged head of the pancreas, and Fig. 275 will explain why an infection in the gall-bladder or bile-ducts can be carried by the lymphatics of these structures to the pancreas, resulting in a pancreatic lymphangitis with a subsequent interstitial pancreatitis, which, in turn, causes compression and, consequently, obstruction of the common duct.

DIFFERENTIAL DIAGNOSIS OF COMMON DUCT CALCULI FROM INFECTION (CHOLANGITIS) AND FROM OTHER CAUSES OF OBSTRUCTION OF THE DUCT

1. **Common Duct Calculi.**—Calculi in the common or hepatic ducts, but especially in the former, may appear under one of

several clinical pictures; *e. g.*, as (*a*) acute complete closure—sudden onset of marked icterus, clay-colored stools, fever, and colicky pains. Such symptoms, if of transitory nature, are usually due either to an acute inflammatory enlargement of the head of the pancreas or less frequently to a calculus (Fig. 274) engaged in the ampulla of Vater. It was formerly believed that the subsidence of the symptoms was due to a form of ball-valve action of the calculus in slipping back into the common duct, as

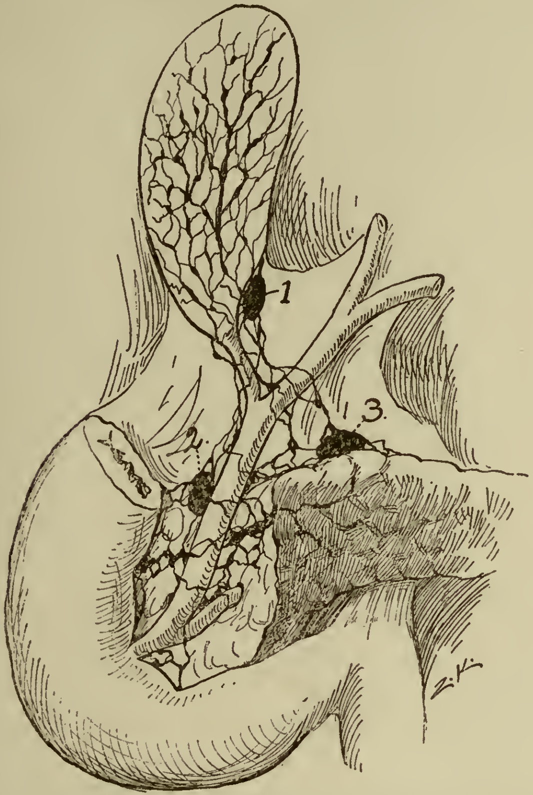

Fig. 275.—Lymphatics of gall-bladder, bile-ducts, and pancreas (modified from Franke): *1*, Lymph-node at neck of gall-bladder which acts as a relay between lymphatics of gall-bladder and those of common duct. *2*, Lymph-node along right edge of common duct which communicates by a number of lymphatic trunks with lymph-nodes of pancreas. *3*, And the last named, in turn, with interstitial lymphatics of the pancreas.

Fenger first pointed out. Körte, Kehr, and others are of the opinion that the intermittent character of the acute obstruction is more likely the result of an acute inflammatory enlargement of the head of the pancreas.

(*b*) Chronic closure cases. In these patients there is more or less constant obstruction of the common duct with resultant icterus, fever, clay-colored stools, colic, and chills. The icterus as well as the other symptoms vary greatly, according to the degree of obstruction and the virulence of an accompanying infection.

(*c*) Latent cases. Moynihan, Körte, Kehr, and a number of other writers have called attention to cases in which either calculi or infection alone, or both combined, were present without any of the above symptoms, usually considered characteristic at least of common duct calculi. In the paper referred to above, I reported finding calculi in the common duct in 10 cases (2 previously operated by other surgeons) in which palpation was negative in all. In 6 of these all of the above symptoms (icterus, fever, chills) were absent, and the colicky pain could not be distinguished from the accompanying gall-gladder infection. This confirms the statement of Kehr[1] that common duct calculi are present in 1 out of 5 cases in a latent form, *i. e.*, without causing the symptoms usually thought to be pathognomonic of common duct calculi.

2. **Adhesions.**—Only by means of a careful *x*-ray examination can the presence or absence of this cause of recurrence be determined.

3. **Overlooked Calculi, Stricture, or Persistent Infection of Common Duct.**—In this case we need only consider that the previous operator has overlooked one or more calculi in the common duct because the gall-bladder has been previously removed. Even if the latter were present, we know that icterus is only present, as a rule, in slight degree in cholecystitis with or without calculi, and the same is true of obstruction of the cystic duct. If icterus were absent, and the gall-bladder had not been removed, it would be rather difficult to distinguish the attacks

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[1] Neue Deutsche Chirurgie, 1913, vol. 8.

of colicky pain due to calculi in the gall-bladder from those due to calculi in the common duct. The pain in the latter is, as a rule, less severe, nearer the median line, and is much more frequently accompanied by the symptoms of cholangitis, such as chills and fever, even when icterus is absent.

The differentiation of stricture of the common duct from calculi in the same is impossible before operation, as a rule, unless the *x*-ray is positive.

Infection within the common or hepatic ducts manifests itself clinically in an acute and a chronic form. In the former, which is probably the result of an acute pancreatitis, there is in the mildest form transitory icterus, dull pain in the epigastrium, slight fever, and a chilly sensation. In the more severe acute form there is a marked toxemia, icterus, and fever of an intermittent type, often preceded by chills and followed by sweats. Death from the profound sepsis may occur in these cases even though the calculi be removed and the common duct drained.

In the more chronic form the above symptoms are present to a lesser degree, but there is a continuance of the infection in the finer bile-ducts in spite of ample drainage. There is no longer any doubt that a severe cholangitic infection can exist without the presence of calculi, just as we see the most grave cholecystitic infection and find no calculi at operation.

4. **Chronic Pancreatitis and Cancer of Head of Pancreas.**—It is practically impossible before operation to distinguish non-malignant enlargement of the head of the pancreas unless there is an ascites and palpable distention of the gall-bladder present as indicative of a malignant tumor compressing the lower end of the common duct. The jaundice is, as a rule, more intense in a malignant enlargement, and the same is true of the absence of bile in the stools. Emaciation is also more rapid.

The differentiation of obstruction of the common duct due to a calculus and that due to a chronic pancreatitis alone is usually impossible unless there is a history of attacks of gall-stone colic preceding the appearance of the symptoms of common duct obstruction. Cholangitis may be present in both calculous and chronic pancreatitic obstruction, so that the presence or absence of the symptoms of infection (chills, fever, etc.) is not to be depended upon as excluding one or the other. Jaundice and clay-colored stools are usually present in both, but are apt to be less marked in chronic pancreatitis. Pain of a dull character is often present in both conditions.

TECHNIC OF OPERATION

The steps of the technic which I employ is best understood by a study of Figs. 276 to 278.

Step One.—The incision (Fig. 276) to expose the gall-bladder extends from the angle formed by the ensiform process and costal arch downward through the inner third of the right rectus muscle to a little above the level of the umbilicus. The patient's lumbar region has been previously elevated by the device attached to the operating tables in common use. The above incision not only permits the most perfect exposure of the common and hepatic ducts as well as gall-bladder, but enables one to inspect directly the stomach and duodenum. It is surprising how close to the abdominal wall such an incision brings the principal bile-passages.

Step Two.—After having inspected the stomach and duodenum, the gall-bladder is examined, and if calculi are contained therein, these are removed by the generally accepted method of an incision through the fundus of the gall-bladder, after having aspirated its contents with the trocar and rubber tube attached to a 3-ounce metal syringe.

Step Three.—Exposure of the Bile-ducts.—The fundus of the empty gall-bladder is grasped by a long-bladed artery forceps, and an assistant instructed to make gentle traction in the direction of the right shoulder. This procedure also pulls the right lobe of the liver in the same direction as first suggested by Mayo-Robson. The neck of the gall-bladder, cystic, hepatic, and common ducts are now exposed. If these structures are enveloped in adhesions, the exposure obtained enables one to separate and ligate the adhesions and to cover with suture raw surfaces by sight and not by touch. A very important detail in securing a good exposure of the common duct is to have the proper retraction not only of the gall-bladder and right lobe of the liver toward the right shoulder but also of the stomach, transverse colon, and of the omentum toward the left and downward. Such retraction is best secured (*a*) by the use of the Deaver and Kelly retractors; (*b*) by not packing too much gauze into the abdomen, and (*c*) by instructing the assistants (preferably only two being employed) only to keep up firm retraction, and not to relax their holds from time to time, thus permitting the above viscera to drop into the field and cover the common duct.

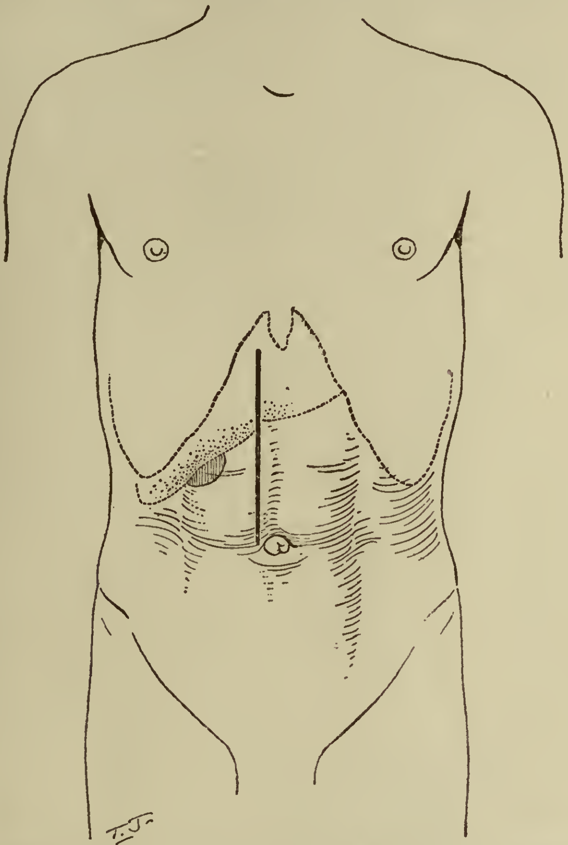

Fig. 276.—Modified Kehr incision through the inner third of the right rectus muscle.

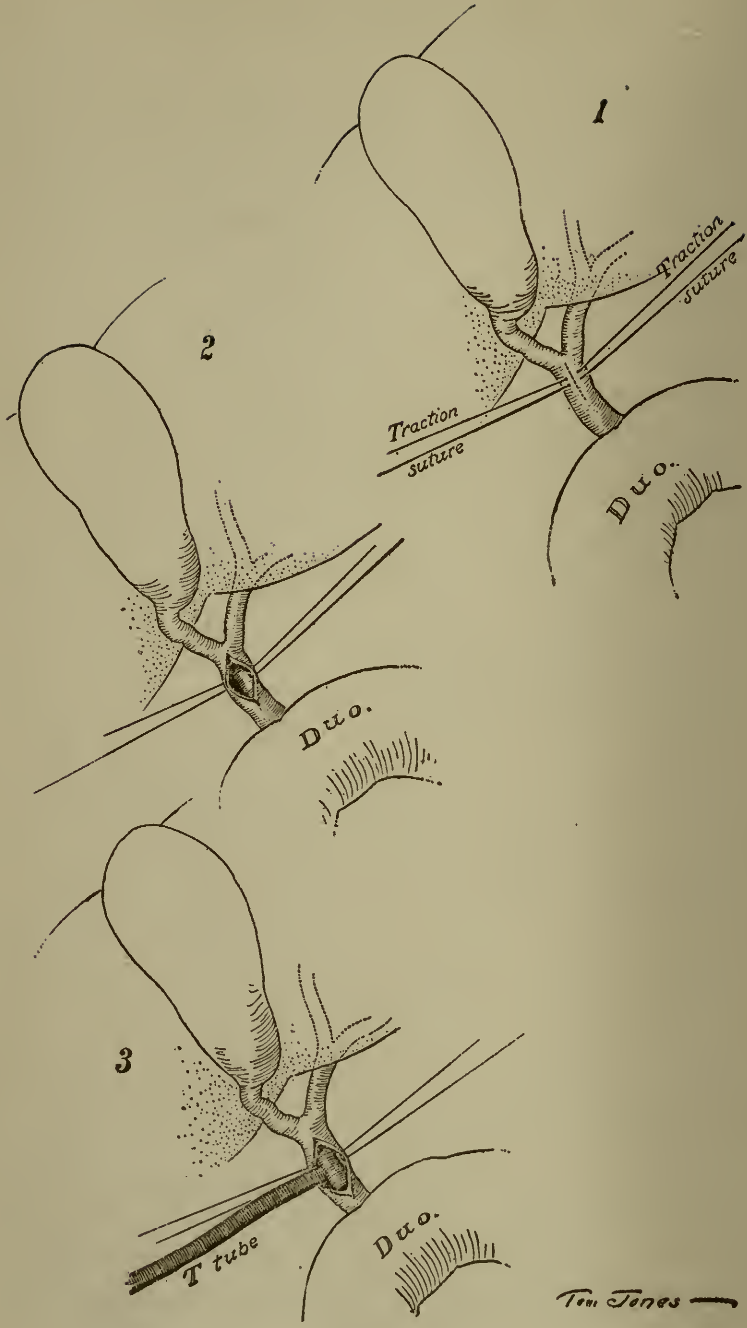
1
Traction
suture
Traction
suture
Duo.
2
Duo.
3
Duo.
T tube
Tom Jones

Fig. 277.

Step Four.—Exploration of Common and Hepatic Ducts.—I prefer to employ instruments and suture material as fine as those used for eye operations in opening the common duct. The hepatoduodenal ligament is first identified as marking the right border of the envelope of peritoneum covering the common duct, portal vein, and hepatic artery. By retraction of the viscera (especially the duodenum) around the common duct the latter is readily seen covered by a thin layer of peritoneum, which is divided by a fine scissors, and the opening thus made widened by spreading it with a blunt-bladed curved scissors. Two traction sutures of very fine (00) catgut are inserted with an extremely small needle (such as is used for eye work) through the wall of the common duct in its supraduodenal portion (Fig. 277). There are a few small veins which run parallel to the duct, and occasionally an anomalous small artery which passes transversely across the front of the duct. Bleeding from both of these vessels is easily controlled by a transfixion ligature. The duct is now incised with a fine, preferably angular, scissors for a distance of ¼ to ½ inch. It is a wise precaution before opening the common duct to place a gauze sponge into Morison's pouch over the right kidney. The opened common duct (Fig. 277) is now explored in an upward direction into the hepatic ducts and then downward, until one feels certain that no calculi have been overlooked. A flexible probe is finally passed through the papilla in order to be sure that the lower end of the common duct is not obstructed.

Fifth Step.—Drainage of the Common Duct.—I prefer the **T**-shaped rubber tube first used by Kehr (Fig. 278), and which is now in this country employed by Deaver and others. The opening in the common duct is closed around this tube with the same size chromic catgut which was employed in the traction

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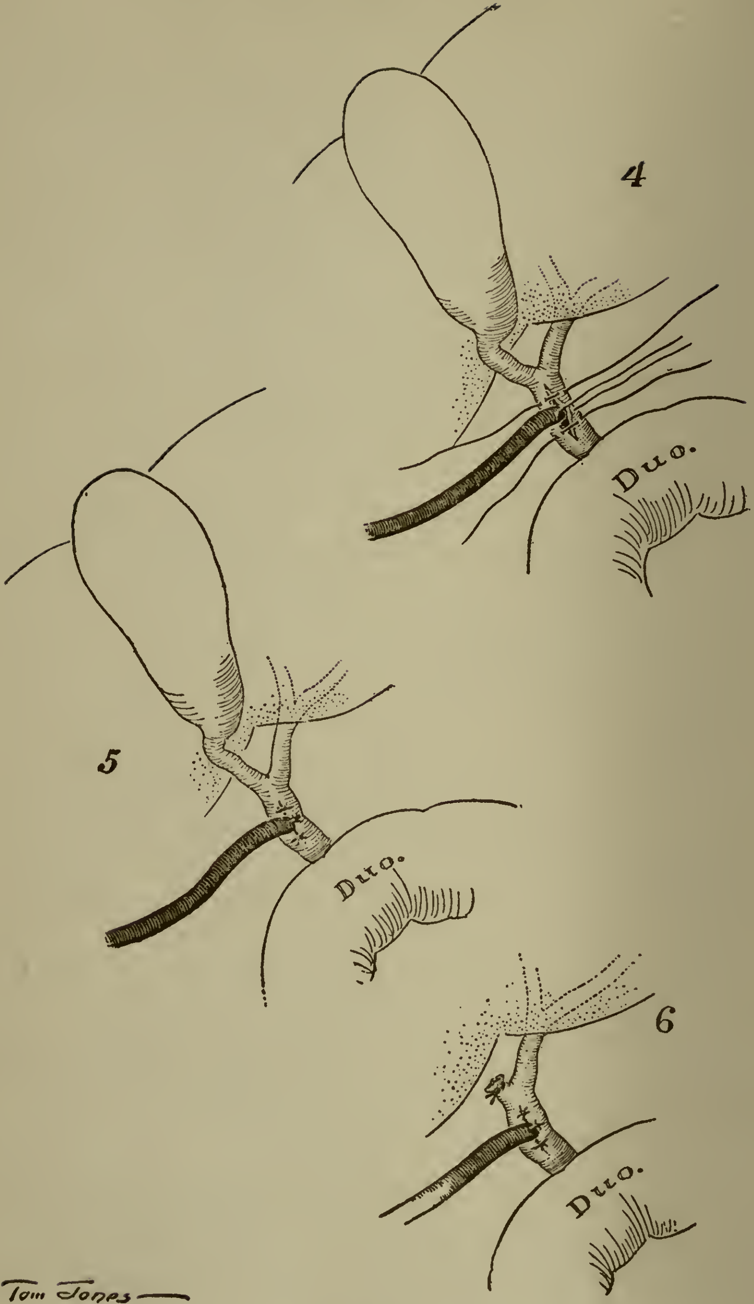
Fig. 277.—*1*, Gall-bladder has been emptied of its contents and drawn toward right shoulder by forceps applied transversely to fundus. Traction suture of fine chromic gut shown inserted through wall of supraduodenal portion of common duct on either side of incision in same. *2*, Edges of incision in common duct retracted before exploration of hepatic and common ducts. *3*, Insertion of **T** tube into supraduodenal portion of common duct.



Tom Jones

Fig. 278.

sutures described in Step Four. The tube itself (whose horizontal limbs should only project about $\frac{1}{4}$ inch beyond the vertical portion) is held in place with a plain catgut suture.

Step Six.—Removal of the Gall-bladder.—I prefer to do the cholecystectomy, if one has decided that the pathologic changes in the gall-bladder demand its removal, after the common duct exploration and drainage, because the gall-bladder is a very convenient tractor for the common duct. Kehr reverses the steps by first removing the gall-bladder and cystic duct close to the common duct, then enlarging the cut end of the stump of the cystic duct so as to make an opening in the common duct large enough to explore both the latter and the hepatic duct, introducing his **T**-tube through the same opening.

The technic of cholecystectomy requires no special description. I first carefully separate the neck of the gall-bladder and cystic duct from the common duct before ligating the cystic artery, which runs, as a rule, along the upper border of the cystic duct. The latter should be ligated as close as possible to the common duct in order to avoid the formation of a gall-bladder in the dilated stump of the cystic duct. The careful separation just mentioned enables one to avoid injury of the common duct if, as frequently occurs, the diverticulum-like enlargement at the neck of the gall-bladder is adherent to the common duct or if any of the anomalies in the course of the bile-ducts shown in Figs. 279 and 280 are present.

A very small rubber tube is sutured with plain catgut (Fig. 278) to the ligated stump of the cystic duct to take care of a possible leakage from the same. Three strips of 2-inch wide gauze are placed around the common duct **T**-tube, one of these strips being placed well down into Morison's pouch over the right kidney.

Fig. 278.—*4*, Sutures of fine chromic gut (00) inserted through edges of incision in common duct in order to close same around **T**-tube. Latter anchored to wall of duct by plain catgut suture shown between the other two. *5*, Appearance of common duct with incision closed and tube in place. *6*, Same as *5*, but showing cystic duct ligated close to common duct after removal of gall-bladder and cystic duct.

Removal of Drains.—The gauze strips are pulled out at the end of eight days and a single narrow one put in their place. The **T**-tube is allowed to remain from fourteen to twenty-one days, and can be easily removed at that time, and it will do no harm if it remains even longer. I have never encountered a case, in nearly forty choledochotomies, where the tube could not be removed by employing gentle traction, and have never seen a common duct fistula follow its employment.

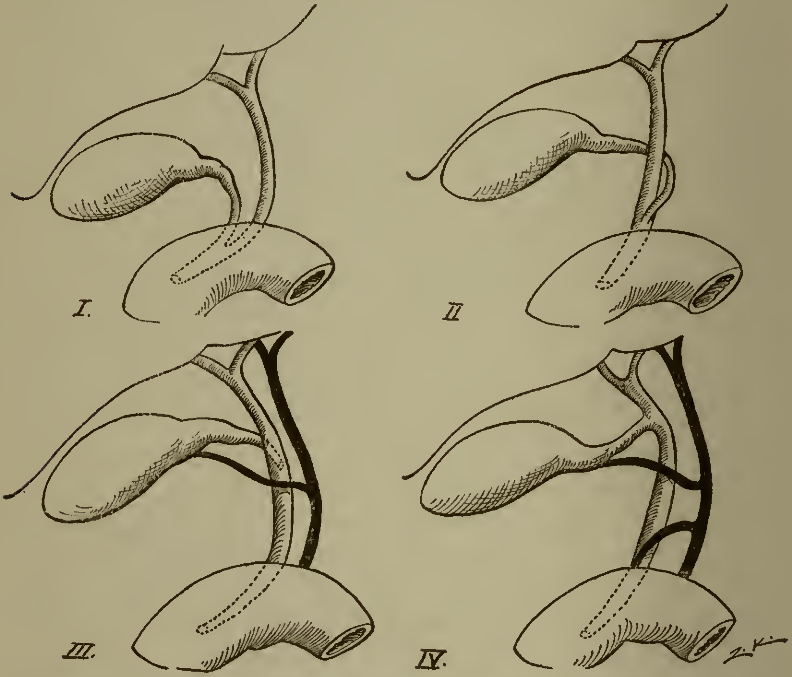


Fig. 279.—Variations in mode of union of cystic and hepatic ducts (Ruge). *I*, Cystic and hepatic ducts have a parallel course and unite behind duodenum. *II*, The cystic duct winds around hepatic duct and unites with it upon its anterior wall. *III*, The cystic duct unites with hepatic duct upon its posterior wall. *IV*, Cystic duct unites with hepatic duct at an obtuse angle with its long front caudal axis instead of at an acute angle, as is shown in figure. Note two anomalous vessels passing across common duct, one as cystic artery to gall-bladder and the other across duct at lower end.

Operative Findings.—After carefully separating the adhesions of the omentum and duodenum to the bed from which the gall-bladder and cystic duct had been removed, I now expose to your view that portion of the common duct which the surgeon

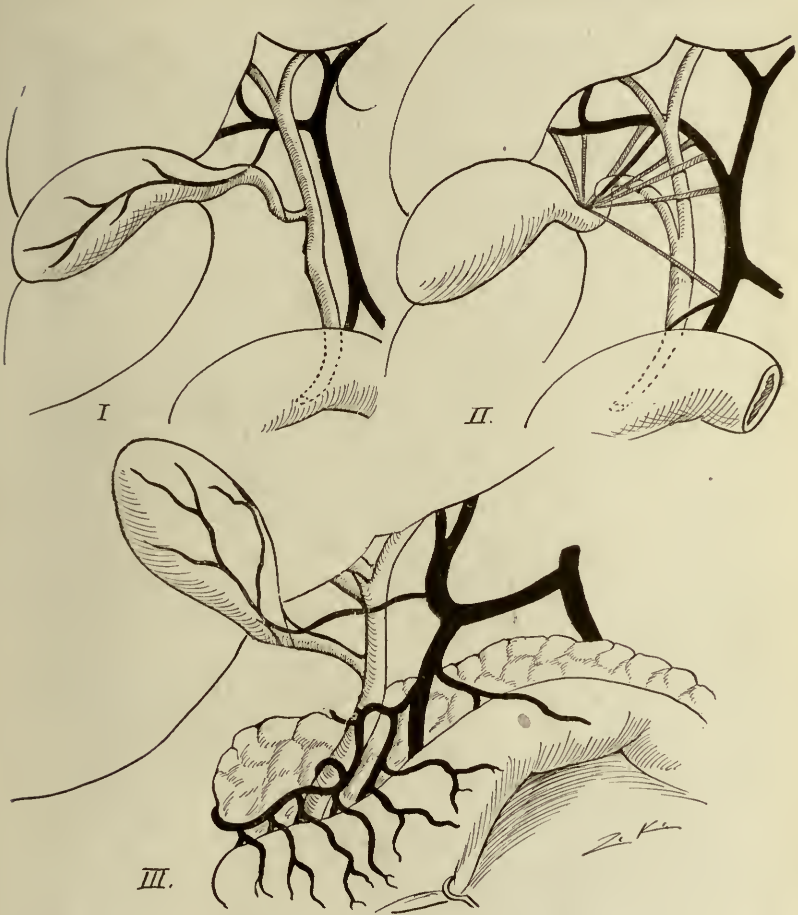


Fig. 280.—Variations in course of cystic artery and blood-supply of retroduodenal portion of common duct: *I*, Normal course of cystic artery and normal mode of union of cystic and hepatic ducts. *II*, Variations in course of cystic artery. The most frequent is shown in black, while anomalous ones are shown in cross-hatched outline. *III*, Great vascularity of retroduodenal portion of the common duct, duodenum being pulled downward. (Del Branco.)

is accustomed to palpate—viz., the supraduodenal portion. I have just called your attention to the fallacy of saying that the common duct contains no stones when the surgeon finds this portion negative to palpation. The common duct in this patient is the size of two adult thumbs, and its walls are very thick and rigid. On palpating through the intact wall of the duodenum I can feel a hard body like a calculus firmly impacted in the ampulla of Vater. We will now open the common

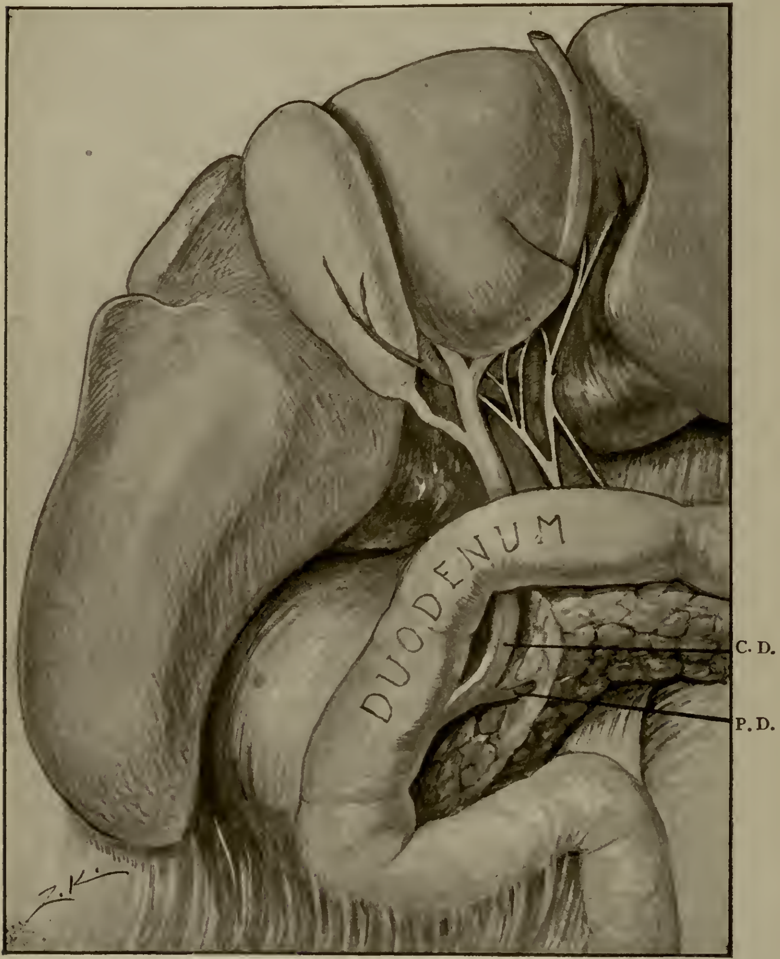


Fig. 281.—Topographic relations of common (C. D.) and pancreatic (P. D.) ducts to duodenum and pancreas (Zuckerkandl).

duct between two traction sutures in the manner just described (Fig. 277). A large quantity of thin, clear yellow bile escapes. The common duct easily admits my index-finger, and the same is true of both right and left hepatic ducts (Fig. 281). The latter, as well as all of the common duct as far down as the ampulla, contain no calculi, but just above the ampulla I find and present to your view two calculi about the size of peas, and wedged firmly into the ampulla and projecting about one-half of its length through this structure is a calculus about the size of a navy bean (Fig. 282). After removal of these calculi the tip of the little finger can be easily passed through the ampulla

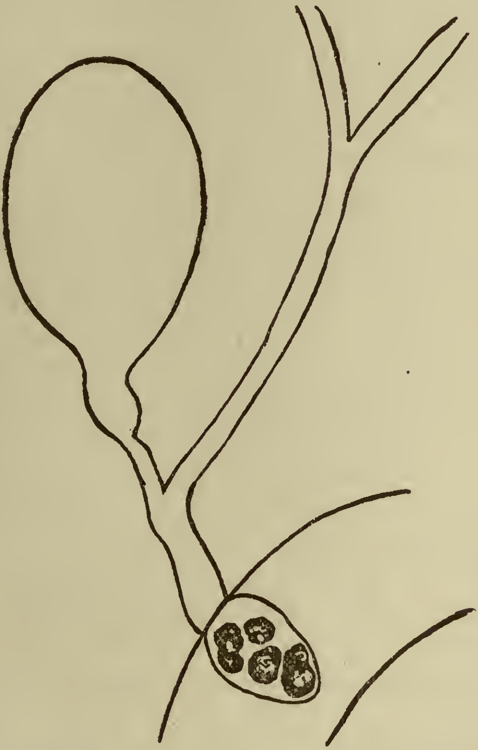


Fig. 282.—Calculi lying in common duct which were overlooked at previous drainage and subsequent removal of the gall-bladder (see text). One calculus projected through and obstructed the papilla of Vater.

into the duodenum. A **T**-tube is inserted into the supraduodenal portion of the common duct, and held in place in the manner previously described and surrounded by three gauze drains. The abdominal incision which passed through the inner third of the right rectus muscle (Fig. 276) exposed, as you have just seen, in a most beautiful manner all of the principal bile-ducts.

Postoperative Notes.—Immediately following the operation the icterus and fever disappeared rapidly, and the patient made an uneventful recovery and was discharged from the hospital with wound healed at the end of six weeks.

The instructive feature about this case is the fact that in spite of negative palpation of the common duct at both of the previous operations, three calculi were found which had evidently been present at the time of the previous operations. This shows the necessity of our opening the common duct more frequently in the future than has been our custom in the past. By doing this under certain indications I have had far fewer recurrences. During the past four years, in the course of a large number of operations on the biliary passages, I have explored the common and hepatic ducts in 30 cases in which palpation was negative. In 10 (33.3 per cent.) of these, calculi[1] were found on exploration in spite of negative palpation. None of these 30 patients died, and I am confident that the mortality will not be increased in the hands of other surgeons if a rapid technic for exploring the common and hepatic ducts is developed by the surgeon.

Of the four indications given by Kehr, three have seemed to me of especial importance, in the order named: (1) The presence of many small calculi in the gall-bladder or cystic duct; (2) an enlarged, thick-walled common duct; (3) the presence of chills, fever, or icterus. To these I would add a fourth—recurrence of pain or symptoms of cholangitis (chills, fever, etc.) after previous operations, such as drainage or removal of the gall-bladder, or even after previous choledochotomies. In 2 of my 10 cases with positive findings (although even my palpation had been negative) operation had been performed by other surgeons.

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[1] In 6 cases the common duct calculi were of such size as to render it improbable that they would have passed into the duodenum spontaneously.

In one of these the gall-bladder had been explored without finding calculi and then drained. Eighteen months later the patient began to have pain in the right hypochondrium with icterus, and I operated on him. The gall-bladder walls were thick, but no calculi were found. The common duct was of the size of two adult thumbs, thin-walled and negative on palpation. On exploration of the common duct a calculus the size of a navy bean was found just above the ampulla.

In the second case the greatly thickened gall-bladder, containing a large calculus impacted at its neck, had been removed by one of my colleagues. Two years later the patient began to have pain in the epigastrium, icterus, chills and fever. I found the common duct greatly enlarged, and although palpation was negative, two faceted calculi, the size of a navy bean, were found just above the ampulla. In neither of these cases were any symptoms referable to the common duct calculi present at the time of the primary operation, and there has been no recurrence since the secondary one.

The chief indication for opening the common duct in 8 cases in spite of negative palpation was the presence of many small calculi in the gall-bladder. In all of the 8 cases of positive exploration after negative palpation the number of calculi in the gall-bladder varied from 20 to 300.

In 3 cases the common duct calculi were the size of a pea, faceted, and 15 in number. In the majority of the 10 cases the calculi were found in the retroduodenal portion of the duct. In 2 cases a number of small calculi of the same size and composition as those in the gall-bladder and common duct were either found in the hepatic duct or escaped in a perfect shower from this duct while the edges of the opening in the common duct were retracted. In one of these patients there has been a recurrence of symptoms in spite of a cholecystectomy and choledochotomy with removal of calculi from the common duct.

I can now add this third case which you have seen today to the other two where secondary operations were necessary for stones which had undoubtedly been present at the time of the first operation. When we recall the fact that 1 in 5 cases of common duct calculi do not show the symptoms hitherto considered characteristic and even indispensable to the diagnosis of calculi located in the common or hepatic ducts, or both, we can readily see that a more thorough operation is necessary in the future. Deaver, in a recent paper, states that he has overlooked common duct stones in 5 of 33 cases of simple drainage, and even in 1 case after removal of the gall-bladder. Since finding common or hepatic duct calculi in 3 of my own cases either drained or cholecystectomized by other surgeons, and, furthermore, since I have found common duct calculi in a total of 11 out of 32 cases where I opened the common duct upon the indications given above, I have become convinced of the necessity for the addition of common duct exploration with subsequent drainage in many more cases than in the past.

CLINIC OF DR. DAVID C. STRAUS

MICHAEL REESE HOSPITAL

STRANGULATED APPENDIX IN A FEMORAL HERNIA; APPENDECTOMY THROUGH FEMORAL INCISION

Summary: A patient presenting the history and physical signs of a strangulated femoral hernia; reduction of a strangulated hernia should never be attempted if there is the slightest reason to believe that gangrene may have begun—always operate; choice of anesthetic; technic of the exposure of a gangrenous hernial sac; management of the strangulated, gangrenous appendix in the present case; radical cure of femoral hernia by means of two mattress-sutures including in their bite Poupart's ligament, the pectineal fascia, the pectineus muscle, and the periosteum of the horizontal ramus of the pubic bone; precautions to be observed.

THIS patient, a female fifty-six years of age, came to the hospital because of a painful swelling in the right femoral region.

She states that several months ago she first noticed a bulging in the right femoral region. This was never very large, caused her no discomfort, and she paid little attention to it.

Six days ago she slipped on the sidewalk and immediately began to have discomfort in the right thigh, and noticed that the bulging in the femoral region had become larger and was tender. The symptoms were not marked until yesterday, twenty-four hours before her entrance into the hospital, when the mass became painful.

There has been no vomiting at any time and no nausea.

On admission a short time ago her temperature was 100° F., pulse 104, and respirations 28. The physical examination is negative except for the swelling in the right femoral region. The abdomen is lax and shows no rigidity whatsoever. Examination of the liver and the spleen shows these to be entirely negative. There is no tenderness over the gall-bladder region or over the region of the appendix. I would like to call your attention to this firm, oval mass, about the size of a hen's egg, lying just below Poupart's ligament and just lateral to the pubic spine, over the site of the femoral ring. You will note that the skin over this mass is blue and discolored. The mass is quite tender on pressure.

From the history and the examination it is clear that we have to deal with a right femoral hernia that has become strangulated and that immediate operation is indicated. The intern's physical examination, taken when she entered the hospital, contains all the physical findings given above, but his description of the mass ends with the statement, "Mass not reducible." This would imply that he had made efforts to reduce the hernia. What an example of poor judgment! It is no doubt needless to state that in strangulated hernia cases, if there is the slightest suspicion that gangrene has already begun, as was shown in this case by the discoloration of the skin, no attempt should be made to reduce it; on the contrary, great care should be taken that it does not become reduced, and it should be operated on immediately.

The patient has been prepared in the usual manner, and the operation will be performed under gas-ether anesthesia.

In passing, it may be well to mention that it is *usually preferable to operate on strangulated hernia cases under local anesthesia*, and a great many surgeons do it as a routine. This is excellent practice. Personally, although I have operated on a considerable number of hernias under local anesthesia, I do not believe that local anesthesia is the method of choice in *simple* hernias unless there is some contra-indication for a general ether anesthetic or some other special reason in any particular case. Without delaying to discuss my reasons for this belief at this time I simply wish to state that in this particular case, although there is no doubt that we are dealing with a strangulated hernia, the patient's general condition is excellent, and there seems to be no special reason for avoiding general anesthesia.

Operation.—An incision about 8 cm. long is made over the center of the mass. This is made parallel to the femoral vessels, which I am now palpating in order to avoid injuring them. As a rule in femoral hernia operations the incision is made parallel to Poupart's ligament, and generally I use that incision in simple hernias. However, the vertical incision appears to be better suited to this case. After cutting through the skin and superficial fascia the mass is exposed, and we find it to be dusky red-brown and very friable. This apparently consists chiefly of fat covered by a thin membrane, resembling peritoneum. One might easily mistake the fat for omentum and the thin fascial covering for peritoneum—*i. e.*, sac. However, as this picture is met with frequently in femoral hernias, we are not deceived, but recognize it to be subperitoneal fat covered by a thin layer of fascia, which, anatomically, is composed of the wall of the femoral sheath (if the hernia has not pushed through one of the apertures in this) and the cribiform fascia or a thin layer of the fascia lata, which have become fused and stretched, and, therefore, present the appearance of a thin membrane and can easily be mistaken for peritoneum. This mass having been exposed, an assistant holds it securely so that none of the contents can slip back into the abdomen. This is a most important point in strangulated hernia operations, for if a gangrenous loop of bowel or a gangrenous piece of omentum slips back into the abdomen it is imperative that it be found and removed, because if it should be allowed to remain in the abdomen the patient would in all probability develop peritonitis. Such a search may necessitate opening the abdomen through a separate incision, and, in any event, considerably complicates and prolongs the operation. This is particularly to be avoided in a patient with a strangulated hernia, as such a patient is usually in poor condition.

To return again to our operation: Next, the *aponeurosis of the external oblique is exposed above Poupart's ligament, well beyond the mass*, and the aponeurosis is followed down until the neck of the sac is reached. This is a simple method of getting into the proper line of cleavage in any difficult hernia operation. When this is accomplished the remainder of the operation is greatly facilitated. The neck of the sac having been reached, an assistant holds it between his thumb and index-finger to prevent any escape of the contents while the sac is separated from the surrounding tissues. In doing this particular care is taken not to injure the femoral vein which lies immediately lateral to it, and also not to injure the internal saphenous vein which empties into the femoral, coming up from below (Fig. 284). The various structures exposed now being easily identified, a blunt retractor is introduced at the upper margin of the femoral ring and Poupart's ligament is strongly retracted upward, completely exposing the neck of the sac. The right index-finger is now introduced and the neck of the sac is completely freed all around. Having freed the entire mass, and having surrounded it with moist gauze pads to prevent soiling the adjacent tissues, we incise the fascia and expose the subserous fat, which is found to be very friable and suffused with bloody serous fluid—that is, it is gangrenous. On very cautious dissection of the subserous fat the true hernial sac—that is, the peritoneal sac—is finally come down upon. This is now opened, and we find it is thickened—edematous. It contains a little foul, bloody, serous fluid, and just one other thing: *The only structure in this sac is the distal end and tip of the appendix, which is gangrenous* (Fig. 283). We will now amputate the sac at the neck, thus removing all the gangrenous portion before we deal with the appendix. In doing this, artery forceps are clamped all about the edges of the remaining part of the neck of the sac so as to prevent it from retracting up out of reach. We now grasp the tip of the appendix and draw it gently downward, so that the entire appendix and lower end of the cecum are brought into the field of operation. It is surprising how readily this is done. After removing the appendix in the usual manner the cecum is returned into the abdomen, and the peritoneum is closed with a circular purse-string of plain catgut. This closure we will reinforce by tying a separate ligature of catgut proximal to the purse-string. The stump is now dropped and allowed to retract.

We will undertake the *radical cure of the hernia*. Two mattress-sutures of No. 2 chromic catgut are introduced so as to sew down Poupart's ligament to the pectineal fascia. The sutures are introduced so as to grasp, at the same time, the pectineal fascia, pectineus muscle, and the periosteum covering the horizontal ramus of the pubic bone. Each suture is threaded with two needles, one at each end. These are short, heavy, full-curved needles. Each needle is passed first through the edge of Poupart's ligament, from above downward, taking a good bite of the edge, and then perpendicularly through the pectineal fascia, and on down through the pectineus muscle until the bone is reached, and here a good bite of the periosteum is taken and the needle is then curved sharply upward, so as to grasp a good hold of the pectineus muscle and pectineal fascia. In this way the

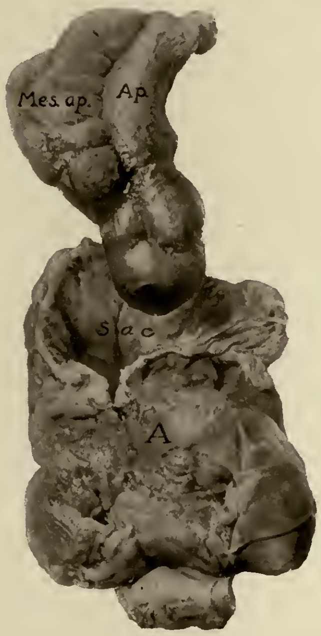

Fig. 283.—The specimen consists of two parts. Above is the appendix with the mesenteriolum attached. At the upper extremity of the appendix the area crushed by the clamp can be plainly seen. At about the junction of the middle and lower thirds, the area of strangulation of the appendix and mesenteriolum is seen as a dark constricted transverse zone. Below this the distal end and tip of the appendix are seen to be distended and discolored. The tip of the appendix curves slightly upward to the left, so that the lower extremity of the appendix does not represent the tip. Here the dark area seen in the photograph is due to a dark red fibrinous exudate covering this gangrenous area of the appendix. The lower half of the specimen consists of the peritoneal sac with a very large amount of subperitoneal fat. This entire mass is greatly discolored and is gangrenous. The funnel-shaped area just beneath the end of the appendix, which is only slightly larger than this strangulated portion of the appendix, is the peritoneal sac. All the rest of the specimen is subperitoneal fat (*A*).

loop of the mattress-suture is made to lie above Poupart's ligament, while the two free ends come out below on the pectineal fascia. Both mattress-sutures are introduced before either is tied. In introducing the mattress-sutures care is taken not to have the loop lie parallel to the margin of Poupart's ligament. This is accomplished by introducing one needle further from the free margin than the other. In this way the loop comes to lie obliquely, and grasps a bundle of fibers and so will not tear out, and at the same time secures a wide area of contact between

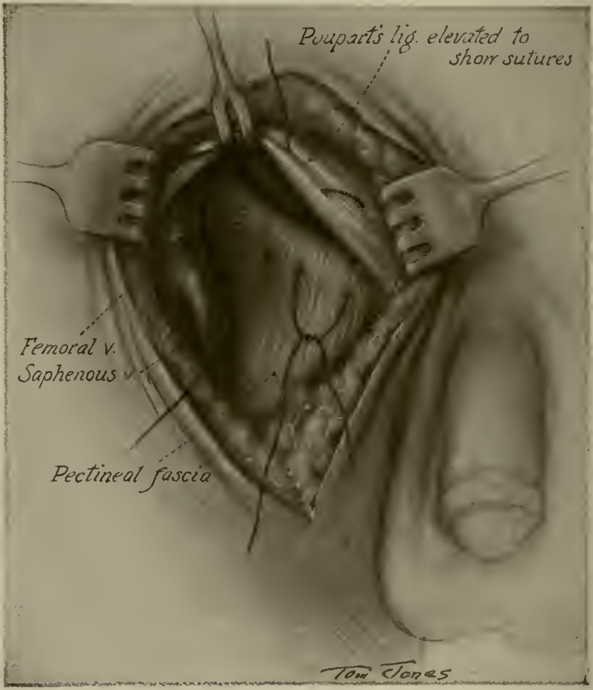

Fig. 284.—Drawing to show how the femoral ring is closed by suturing Poupart's ligament down to the pectineal fascia, pectineus muscle, and periosteum of the superior ramus of the pubis. The drawing has been made somewhat diagrammatic so as to make it clear how the sutures are inserted. The incision is shown longer than at operation; and Poupart's ligament is held upward in order to show how the sutures, after passing through Poupart's ligament, are passed down through the pectineal fascia until the bone (horizontal ramus of the pubis) is reached, and then, grasping a bite of the periosteum, are carried upward through the pectineus muscle and pectineal fascia, on the surface of which the knots come to lie.

Poupart's and the structures beneath it. The periosteum covering the superior ramus of the pubic bone is strong and gives a firm hold to the stitches. This method of introducing the sutures, having the additional strength of the strong periosteum, gives a more secure closure than merely uniting Poupart's to the pectineal fascia alone. Before tying the sutures it is well to test that they have a strong hold. In some individuals the pectineus muscle does not extend laterally as far as the femoral vein. There is a gap here where the horizontal ramus of the pubic bone is covered by the pectineal fascia and periosteum only. These suffice to give a good hold to any stitch that is inserted. In introducing the stitches great care is taken not to puncture the femoral vein, the saphenous vein, or the femoral artery. We have placed the first suture close up against Gimbernat's ligament. The second, or lateral suture, lies just alongside the first, and we are taking care not to place it too close to the femoral vein. The internal of the two sutures is tied first, and in tying the second, or lateral suture, care is taken not to compress the femoral vein. This must always be carefully guarded against. One mattress-suture usually suffices to effect a satisfactory closure. In other cases an additional single interrupted stitch may be required (Fig. 284). It is rarely necessary to use two mattress-sutures. Before being satisfied with the closure, however, it should be tested with the index-finger.

We are inserting a soft-rubber drainage-tube down to the closed ring, and are closing the skin with a black waxed-silk running suture, which we are interrupting once or twice so that a portion of it may later be removed in case more drainage seems indicated.

Note.—Recovery was uneventful. There was a slight amount of discharge for a few days only. On the fifth day after the operation the drainage-tube was replaced by a plain gauze drain, and after the sixth day no more drainage was used.

The patient was kept in bed until the thirteenth day, when she was allowed to be up in a wheel chair. I keep all hernia cases in bed for at least ten days as a routine and very fleshy patients are kept in bed for a few days longer. The patient walked on the twenty-first day and was discharged on the twenty-second day.

While this case is not unique, strangulation of the appendix in a femoral hernia is extremely infrequent. Without attempting to review the literature on this subject, it may be of interest to know that Alti, in his thesis,[1] gives an excellent account of hernias of the appendix with a full bibliography. He discusses cases of strangulated appendix in a femoral hernia reported by Schwartz,[2] Pollosson (3 cases),[3] and Brieger (several cases).[4] Brieger reviews all the cases reported from the time of the appearance of Klein's monograph, "Uber die ausseren Bruche des processus vermiformis coeci," Giesen, 1868 up to 1893. During these twenty-five years Brieger found there were but 15 cases of hernia of the appendix alone in femoral hernias. Of these, 3 cases were irreducible but not strangulated. In 10 cases there were symptoms of strangulation. In some of these 10 the appendix was gangrenous. In others gangrene had not yet developed. In the remaining 2 cases no accurate description was given. In 1911 Paul Oliver,[5] of Chicago, reported a case of strangulation of the appendix alone in a femoral hernia. There was no case of strangulation of the appendix in a femoral hernia observed during the year 1916 and only one case was reported during 1915. This case, reported by Downes,[6] was practically identical with the case you have just seen. Girolamo[7] in 1914 wrote an excellent and comprehensive article on hernias of the appendix in general, and completes his article with a very full bibliography.

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[1] L'Appendice iléo-cœcal et ses hernies, Paris, 1894. (Available at the Surgeon General's Library, Washington.)

[2] Hernie crurale étranglée et enflammée de l'appendice iléo-cœcal; Rev. gén. de chir., 20, p. 313.

[3] Etranglement herniare de l'appendice iléo-cœcal et son traitement, Lyon méd., 23 mai, 1893.

[4] Hernies de l'appendice vermiculaire, Arch. für klin. Chir., 1893, Bd. xlv, p. 892.

[5] Jour. Amer. Med. Assoc., December 16, 1911, lvii, 25, 1969.

[6] Strangulated Femoral Hernia; Sac Containing Appendix Only. Annals of Surgery, 1915, lxi, 355-357.

[7] L'ernia dell'appendice vermiforme del cieco. Riforma med. Napoli, 1914, xxx, 508; 546.

CLINIC OF DR. ARTHUR H. CURTIS

St. Luke's Hospital

REMARKS ON LEUKORRHEA

Summary: The nature of leukorrhea—types of secretion; places of formation; the cervix, urethra, Skene's ducts, and Bartholin glands chiefly concerned; the fallopian tubes and endometrium rarely the source of the discharge; pathogenesis of leukorrhea; gonococcus pre-eminent; lacerations and systemic disease of secondary importance; treatment: necessity of ascertaining all direct and predisposing causes; value of silver nitrate, formalin, radium, and "dry" treatment; status of vaccine therapy.

Leukorrhea, according to its accepted meaning, includes any excessive discharge from the vulvovaginal canal.

The discharge is either mucoid or purulent in character. A mixture of mucus and pus in various proportions is common. Great variation in the consistency of purulent discharges is also found; the more thin and watery the pus, the more severe and more persistent, as a rule, is the infection.

Normal vaginal secretion (Fig. 285) is acid; in leukorrhea the reaction often becomes neutral or alkaline.

Where Discharges May Arise.—There is much indecision on this point, which renders difficult any agreement on the causes or treatment of leukorrhea. It therefore seems desirable to give this topic most detailed attention.

For the sake of thoroughness we will consider all pelvic organs which might be involved.

The Fallopian Tubes.—Because of the downward and outward inclination of the tubes, we know they do not persistently drain their contents into the uterus. That would be mechanically almost impossible. If the tubes are ever responsible for leukorrhea it must be a secondary responsibility through repeated reinfection of the uterus.

The Body of the Uterus.—The medical world has been inclined to accept the uterine origin of leukorrhea; in fact, this belief has been passed on even to the laity. Practically every woman who has leukorrhea assumes her trouble to be a "womb" discharge.

As we stated, leukorrhea is either mucoid or purulent. The uterus then, to be the source of leukorrhea, must continuously secrete mucus or must be infected and yield pus.

The question of mucus is quickly considered. It appears that there is only one time in the normal menstrual cycle when mucus is secreted from the uterine glands. This is for a few days just prior to menstruation (Fig. 286); at times other than the premenstrual period there is probably no mucous formation. In pathologic conditions, such as passive congestion, polypoid endometrium, etc., we may expect more mucus, but limited chiefly to those times corresponding to the premenstrual stage. The daily repeated appearance of non-infectious mucoid leukorrheal discharge is therefore not to be expected from the body of the uterus.

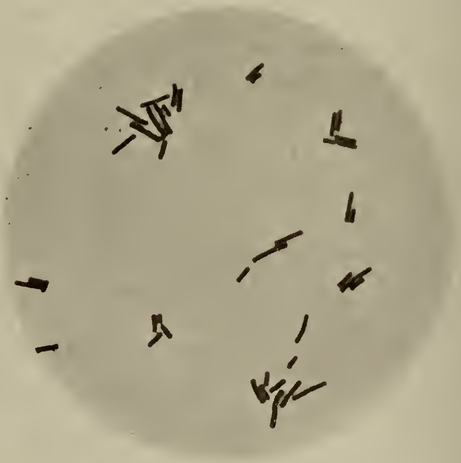

Fig. 285.—Döderlein bacilli in smear from normal vagina. A usual picture in smears from non-infected, nulliparous women.

The question of infection of the uterine endometrium has remained somewhat open. Most of you probably feel inclined to the belief that this is a tissue frequently subject to chronic infection. You should know of the experiences of Kelly's clinic at John Hopkins. In a histologic study of endometria from 800 pathologic cases in that clinic, Cullen was able to find evidence of endometritis in only 49. Similar evidence from histologic study has been obtained by Charles Norris.

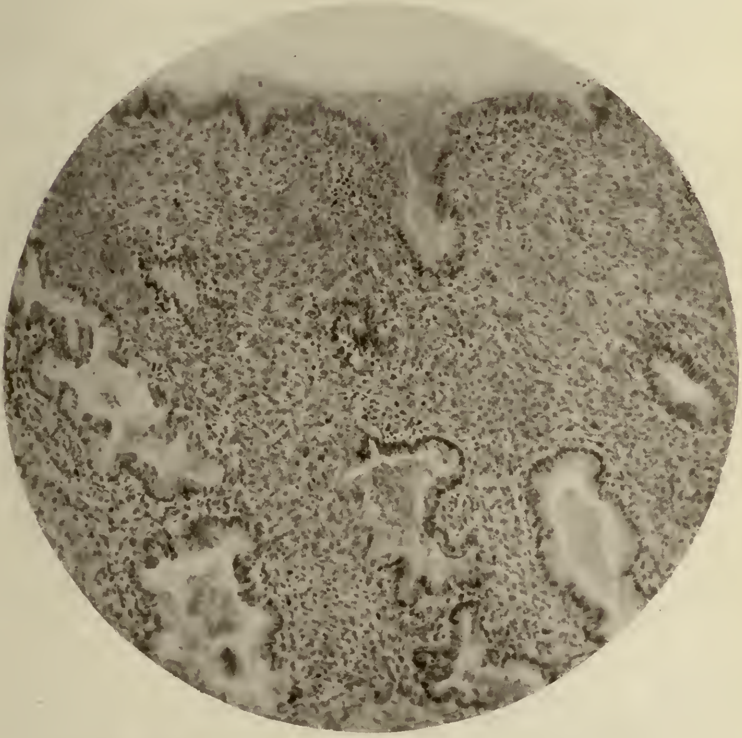

Fig. 286.—Mucous secretion from normal premenstrual endometrium.

From personal work I am satisfied that bacteria are infrequent in the body of the uterus in chronic pelvic disease. In a study of the bacteriology of the uterus I have been removing the greater part of the endometrium, and have made cultures not only from smears of the surface, but from the entire crushed and ground material from each case. This work has convinced me that the body of the uterus is to be thrown out of consideration as a common source of chronic infectious discharges.

The Cervix.—Now we come to a region below the internal os. This tissue is open to invasion from the outside. It has no real barrier against infection. The cervix is exposed to direct infection at intercourse, is washed in a mixture of desquamated vaginal epithelium and bacteria, is exposed to various irritating douches, is subjected to digital manipulation, and is bruised and torn at the time of labor.

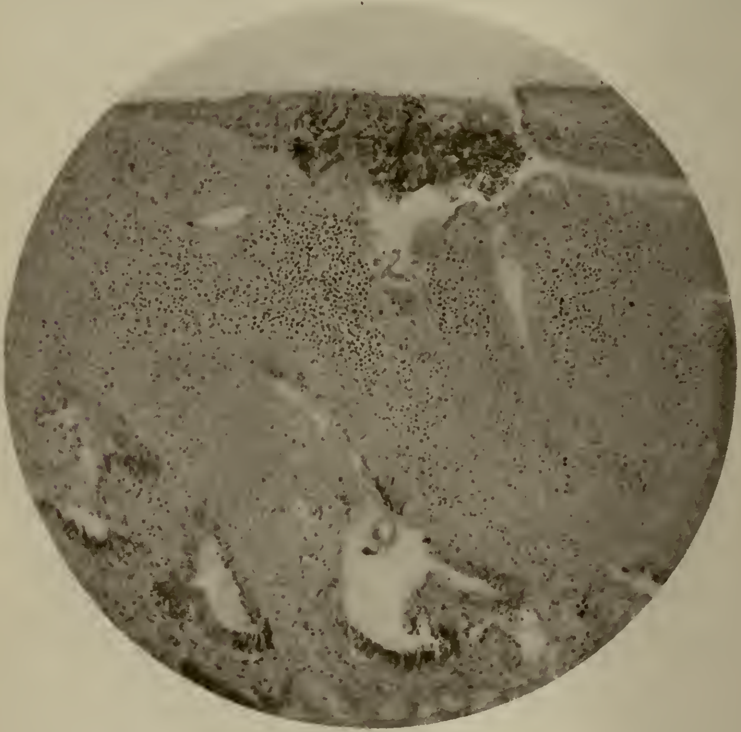

Fig. 287.—Section through diseased cervix of patient with chronic leukorrhea. An infiltration with plasma cells and polynuclear leukocytes, as here shown, is typical of these cases.

The glands of the cervix continuously secrete mucus. Any of the factors just mentioned have the power and the tendency to increase the number and the activity of these glands. From the cervix, therefore, excessive mucous discharges originate, and they tend to persist until destruction or lessened activity of the glands occurs.

Likewise, being virtually a part of the vaginal canal as far as accessibility to bacteria is concerned, the cervix is easy prey for infection. It follows that purulent discharges may also originate here (Fig. 287).

The *vaginal wall*, covered with squamous epithelium, is little subject to infection. It is seldom the source of chronic inflammation except in asthenic conditions, *e. g.*, in the aged and in diabetics. The vagina serves mostly as a gathering place for bacteria and for accumulation of discharges; the part it plays is chiefly a passive one.

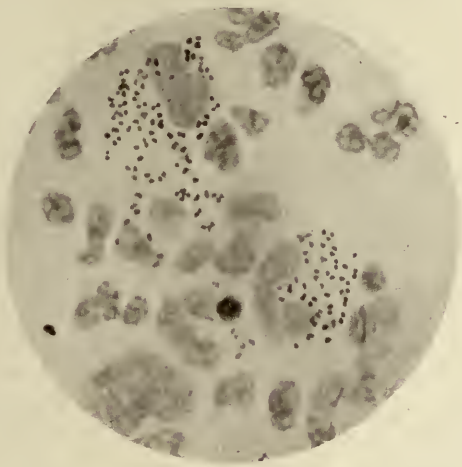

Fig. 288.—Smear of pus-cells and gonococci from abscess sac in Skene's duct. A common focus of infection in patients with chronic discharge.

The *urethra* and *Skene's ducts* are frequent foci for the generation of leukorrheal pus. At this time I have under observation a case in which splitting open an infected Skene's duct was promptly followed by cessation of a long-standing creamy vaginal discharge. Abscess sacs formed in Skene's ducts, having origin in gonorrheal infection of the ducts, are among the frequent contributors to chronic leukorrhoea (Fig. 288).

The *glands of Bartholin* seem less concerned with the causation of leukorrhea. This may be because drainage from them is less free when they are infected.

Resumé.—Let us group these facts together.

Leukorrheal discharges from the body of the uterus are not common. When present they are rarely purulent; periodic mucoid discharge may occur either as a result of excessive premenstrual mucus formation, or under pathologic conditions which create similar changes in the endometrium.

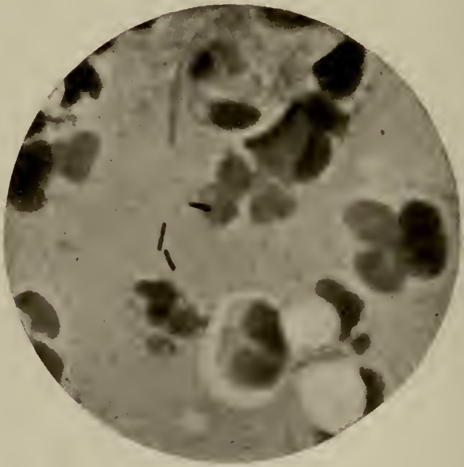

Fig. 289.—Smear from a patient with profuse acute "non-specific" leukorrhea. Much pus and a pure growth of Gram-positive bacilli were found. Infections such as this are not rare.

The cervix is a frequent seat of leukorrhea formation, whether mucoid or purulent. The urethra and Skene's ducts, especially the latter, rival the cervix as foci from which purulent discharges arise; it is common for all three to be infected simultaneously. The Bartholin glands seem a less frequently responsible source of leukorrhea.

Pathogenesis of Leukorrhea.—In the bacteriology of leukorrhea the gonococcus stands out preëminently. It is the underlying cause of most purulent discharges of women who have not borne children. In chronic cases the gonococcus cannot often be isolated. Very frequently probably it has died out. But the gonococcus causes the original discharge, irritates and decreases the resistance of the tissues, and in these ways prepares the soil for mildly virulent bacteria, which thereafter successfully resist every effort of nature to rid herself of their presence. That exceptional, severely acute, "non-specific" cases do occur, however, must always be borne in mind. We should not diagnose acute gonorrhea without microscopic control (Fig. 289).

In parous women the course is analogous, but the method differs. Childbirth takes the place of the gonococcus. The soil is prepared through such factors as laceration of tissues, continued passive congestion, and increased cervical secretion resultant from lacerations and erosions. In these tissues, with resistance below par, the mildly virulent bacteria again find conditions favorable for their work.

There remain less important groups of cases neither the result of childbirth nor due to invasion of the gonococcus. Their cause is chiefly decreased local resistance. For this a systemic derangement, such as tuberculosis or diabetes, may be responsible; more often there is pelvic pathology with passive congestion or exudate.

It is not to be denied that virulent organisms other than gonococci may attack these regions when the tissues are normal. But in a large series of cases, with painstaking bacteriologic studies, I have seen little evidence of this. Streptococci, notably anaërobic streptococci (Fig. 290), are found here, but they lack toxicity for animals. Moreover, the streptococcus is just as frequent in postgonorrheal leukorrhea as in those of other etiology. Small Gram-negative anaërobes, which are most frequent and most numerous of all, also appear to be non-virulent. Other bacteria are chiefly anaërobes; all are evidently harmless for laboratory animals.

Treatment.—What is to be done with a patient who complains of a chronic discharge?

A history and thorough examination are always in order. Any gross pelvic lesion which maintains congestion may be responsible for leukorrhea. This includes extensive lacerations, tubal infections, adherent displacements, and kindred ailments. It cannot be anticipated that leukorrhea will be permanently cured if such predisposing lesions are not corrected by proper surgical attention.

Again, we find that some general physical condition, such as a poor heart, may cause congestion and need attention. Or interference with the general health may lower resistance, as in tuberculosis or chlorosis, and the vaginal flora flourishes because of low vitality. Advice concerning the care of such cases would be ill timed; you need only that attention be called to their possible influence.

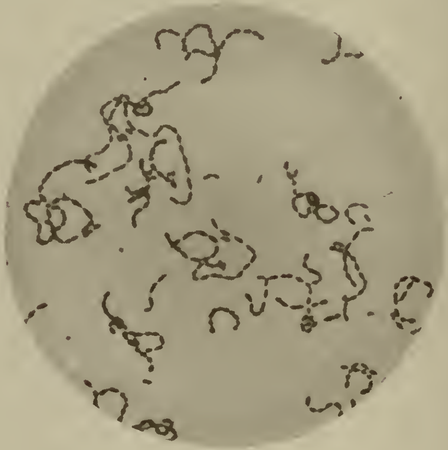

Fig. 290.—Anaërobic hemolyzing streptococci isolated from a patient with chronic leukorrhea. These streptococci possess little virulence.

But in this special field of therapy still more detailed study is needed—we note the amount of discharge, its character, and reaction. Smears are made to determine the amount of pus, also the types and relative proportions of various bacteria. Many culture tubes and plates are inoculated with varying dilutions of the discharge to isolate the organisms.

We examine Skene's ducts, the urethra, the cervix; for these are of the utmost influence in determining our treatment.

Granted that the patient is in good local condition from a surgical point of view and that the general health is good, the leukorrhea should be curable.

Into *infected Skene's ducts* 20 per cent. silver nitrate is introduced on a probe. If resistant to cure, the ducts are threaded on the blunt end of a needle, the tract split open, and the lining cauterized.

Chronic urethritis seldom persists after duct cauterization. Dilatations of the urethra and weak silver nitrate instillations may be needed.

The *cervix* has been a bugbear. Plastic operations are good for little except mucous discharge from erosions. Complete amputation is a serious operation, to be undertaken only as a last resort. This limits treatment to local applications.

Most notable of favorite remedies are iodin, silver salts, and the actual cautery, all of which have had many adherents. It is my belief that pure formalin is superior to all these. As claimed by Menge, formalin evidently possesses remarkable penetrating powers. Several uterine applicators are wound with thin wisps of cotton, dipped into formalin, and each in turn introduced up to, or slightly beyond, the internal os. Applications are painful unless most carefully made, and cotton packing behind the posterior lip is required for protection of the vagina. Treatment once or twice weekly may be extended over several weeks' time.

Radium.—In the event of unsatisfactory results with formalin, radium is advisable. My experience with it thus far has been very gratifying. It is best administered under gas anesthesia. After thorough dilatation of the cervix, 50 milligrams, screened with 1 mm. platinum and encased in a finger-cot, are inserted *up to the level of the internal os.* A suture placed through the external cervix, and including the outermost end of the finger-cot, holds the radium in position. It is allowed to remain for fourteen to eighteen hours.

Other measures available in combating leukorrhea include "dry" treatment and the use of vaccines.

Dry treatment consists in carefully cleansing the cervix and vaginal canal with cotton, followed by application of powder. The chief virtue of this treatment consists in keeping the parts dry for long enough periods to permit them to return to a condition of normal resistance. The powders chiefly used are aluminum acetate, or aluminum acetate with kaolin and talcum. Various remedial agents, notably iodin, silver nitrate, hydrogen peroxid, and yeast, are often added.

My attitude concerning *vaccines* is the following:

If diplococci appear numerously in smears, and grow in streptococci in preponderance in cultures, an autogenous streptococcus vaccine should be made.

Provided any other organism occurs almost exclusively in fresh smears and in cultures, it should be made into vaccine.

In other instances, if the discharge is highly purulent or watery, with no organism in predominance, a composite vaccine is made. This is secured by inoculation of a basket of tubes *directly from the patient.* These are cultured anaërobically and washed off for vaccines. The usual method of making vaccines from subcultures of the original growth is worthless. Such tubes in subculture are overgrown by rapidly multiplying forms of bacteria; hence vaccines made from them do not satisfactorily represent the vaginal flora against which vaccination is directed.

My present belief is that vaccines are helpful. As an adjunct to other measures they are to be advocated. But they should be thoroughly representative of the leukorrheal flora and prepared with painstaking technic.

In supervision of the general health, careful regulation of the bowels is to be closely watched; it is a factor of more than usual importance. Most patients do best on a diet with limited meat, abstinence from alcohol, and avoidance of all seasoning except salt.

To a certain number the outlined treatment does not bring relief. Such patients find helpful the nightly insertion of vaginal suppositories containing 3 grains of hydrastis. Douches, evidently devoid of curative value, may be permitted for relief of discomfort; it should be explained that they tend to increase the amount and duration of the discharge.

CLINIC OF DR. PHILIP H. KREUSCHER

Mercy Hospital

SEMILUNAR CARTILAGE: FRACTURE-DISLOCATION AND FRAGMENTATION

Summary: Gross pathology of internal derangement of the knee-joint; causes of the disorder—illustrative case histories; the diagnosis; treatment—futility of palliative measures—the operative technic; after-treatment.

History.—This patient, a male aged thirty-eight years, was admitted to Mercy Hospital because of trouble in his left knee joint. Previous and personal histories are negative.

The present trouble began twelve years ago while he was playing football. He stepped into a hole, severely wrenching his left knee. The pain was intense, and it was only after some manipulation that he was able to walk. The next day the swelling was considerable and there was a great deal of stiffness present. For six months following the accident he was not without pain in the knee-joint for more than a few hours at a time. One day, while walking on the street, he twisted his body and noticed that something snapped in the left knee. The knee was locked and would not extend until after considerable manipulation. Such attacks came on quite frequently, and each time he would be incapacitated for two or three days following the accident. The knee swelled immediately, and there was a localized soreness on the inner side of the knee. The last locking was three months ago.

Comments.—One of the most frequent lesions in or about the knee-joint, which may not be recognized when the patient is first examined, is semilunar cartilage disease. There may be present a simple dislocation of part or all the semilunar cartilage or there may be a dislocation and fracture, so-called fracture-dislocation, of the cartilage; again, one frequently finds fragmentation of portions of the cartilage without any separation of the external attachments of this body (Fig. 291). Etiologically several types are recognized: First, fracture or dislocation, due to direct external trauma; second, malposition or fragmentation of the cartilage, due to internal trauma, for instance, very quick twisting or flexion of the knee-joint under weight; third, we may find loosening and fraying of the cartilage, due to chronic synovitis or osteo-arthritis.

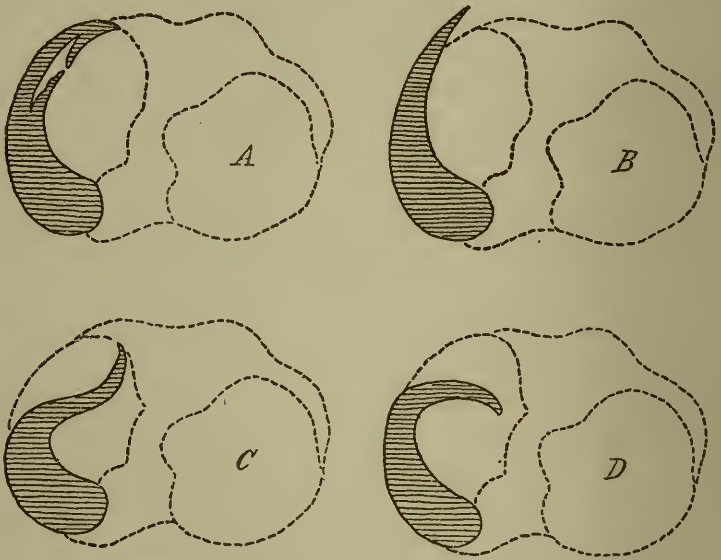

Fig. 291.—*A*, Internal cartilage crushed by pressure between femur and tibia; *B*, separation of anterior attachments of cartilage by forcible extension; *C*, position of separated cartilage on full extension; *D*, separated anterior end of cartilage lying between fibia and tibia on full flexion (Walton).

Patients doing actual manual labor, such as coal-miners and those pursuing athletic sports, especially football, most frequently present themselves with this lesion. The internal semilunar cartilage is injured most frequently. Various authors give the proportion as 20 internal to 1 external. Rutherford Morrison, of Newcastle, places the proportion of internal semilunar cartilage injuries as 50 to 1 of the external. Walton, in the British Medical Journal, reports 85 cases, 81 of which were internal. Martin, who has treated 449 cases, found that 92 per cent. were internal. His cases were mostly coal-miners, and he found that in 95.5 per cent. there were fractures and tears, and that only 4½ per cent. showed no definite pathology, probably a loose cartilage.

The mechanism of the injury as seen in coal-miners is easily understood. The patient, working in a stooped position and using his knee as a fulcrum for his shovel-handle, suddenly twists the femur upon the tibia in such a way as to loosen the semilunar cartilage. If this occurs frequently, the continued pinching of the edge of the cartilage causes a fraying or a fragmentation of the cartilaginous substance. In other cases there is a sudden, unexpected trauma to the internal portion of the upper end of the tibia, which causes loosening and occasionally a fracture of the anterior half of the cartilage. A typical history of this type was given by a patient, a male, thirty-eight years of age, who had struck the inner side of his knee against a chair. The traumatized area felt a little sore and painful for a few days, but was not swollen or inflamed. After some weeks the patient noticed that the knee became tired when he walked for any length of time. There was very little trouble for a period of months, until one day while walking he twisted his knee slightly and noticed a sudden slip in the knee-joint, which was attended by some pain. The knee was in a flexed position, and he found that he could not extend it. It was "locked." After some manipulation the knee became "unlocked" and the patient went about as before. Subsequently he had seven or eight attacks of the locking, which occurred most commonly when he twisted the femur on the tibia under his weight with the knee slightly flexed, as when attempting to go upstairs. So frequently did this accident occur that the patient became totally incapacitated.

Here is another history typical not of a primary external trauma, but of an internal injury to the knee-joint. The patient, a female aged thirty-five years, without any previous history of trauma or trouble with the knee-joint, on arising from a chair suddenly twisted her knee and was immediately seized with an acute pain on the inner side of the knee-joint. The joint was locked and only after considerable manipulation and rubbing could she move it again. She said she felt something slip out of the joint as the pain came on. Two hours later, while walking in the street, the same accident happened. The knee was swollen and painful for about two weeks, during which time she rested and did not use her limb at all. After getting up and about she had repeated attacks of pain and locking and became practically incapacitated.

Let us analyze this history. The sudden twist undoubtedly loosened the anterior portion of the internal semilunar cartilage and caused it to slip out of the knee-joint and become palpable under the skin. After some massage and manipulation this tip slipped back into its position, only to be forced out again at the next twisting motion of the knee. At the operation in this case it was found that the cartilage was not fractured, but loosened to such an extent that it slipped in and out of the joint very freely.

Stab or puncture wounds about the knee-joint may frequently fracture or separate a portion of the cartilage from its attachment. Such a case came into Dr. Murphy's service in 1914 with the following history: At the age of eight years the patient, a female, fell and struck upon a broken bottle, cutting a deep gash just internal to the patella. For sixteen years the right knee would become locked at intervals, so that she would be unable to walk and would have to go to bed for relief. The knee sometimes remained locked for from three to ten days at a time. It is interesting to note that the unlocking always occurred during sleep, that is, at the time when there was complete relaxation of the muscles about the knee-joint. This accident happened so frequently that it was only with extreme care while walking and getting up from a sitting posture that she was able to be up and about. Unfortunately, this patient was in a run-a-way accident some years later and was thrown from a carriage, falling with her full weight upon both knees. Soon after this a grating sensation developed in the right knee. This grating gradually increased in intensity and frequently was accompanied by considerable pain. Because of the pain and because of the fear that the knee-joint would become locked the patient would, whenever possible, throw her weight upon her left limb, until that too began to show the same grating as the right. The knee did not lock, but there was a constant drawing feeling in the knee and in the muscles of the thigh. Fixation had taken place, so that the patient could not bend the knee sufficiently to climb stairs.

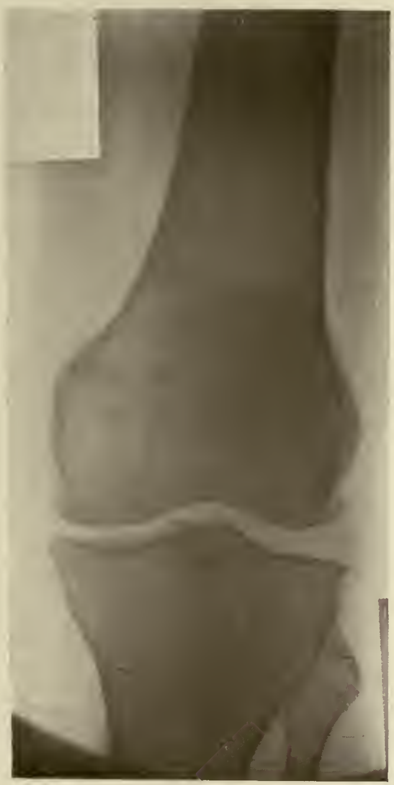

Fig. 292.—Pre-operative skiagram of knee-joint. Note the lipping of external edge of the femur and tibia (Murphy).

This case presents two distinct lesions, but both of them, as was shown by operation, involving the semilunar cartilages as well as other structures of the knee-joint. The sequence in the right knee was trauma first, then luxation of the internal semilunar cartilage, with the development of traumatic osteoarthritis with periosteal and cartilaginous ossification, as shown in Figs. 292 and 293. As the result of the irritation of the displaced cartilage there developed a traumatic synovitis, which by its recurrence produced thickening and then chondrification of the capsule. The skiagrams of the left knee-joint show the obliteration of the space between the internal condyle of the femur and internal tuberosity of the tibia owing to the partial destruction of the internal semilunar cartilage. A hypertrophic arthritis has developed, which has resulted in lipping of the tibial tuberosities and the external condyle of the femur as shown in Fig. 292.

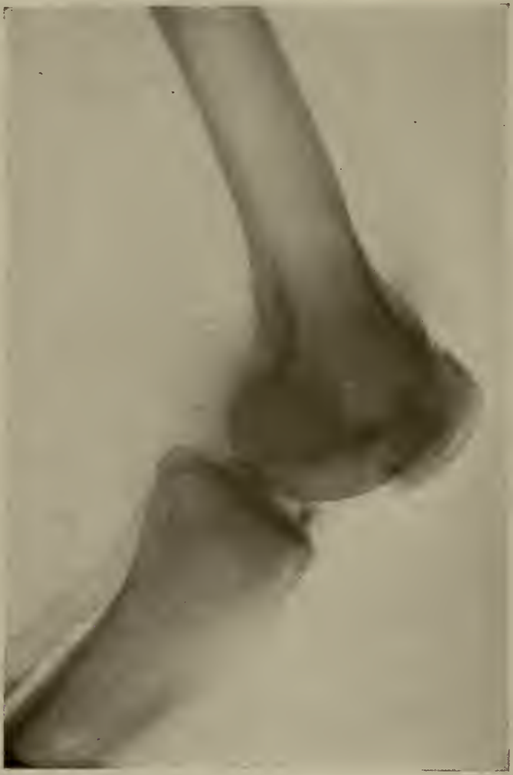

Fig. 293.—Lateral view of preceding figure. Note the osteophyte on tibia, not in semilunar cartilage (Murphy).

As in all other joint lesions, it is very necessary that we have a most accurate case history and skiagrams from various angles before a logical diagnosis can be made. The reason so many of these cases are not diagnosed is because we do not take time to listen to the patient's story. We are so apt to think of the more common joint lesions as we see them in our daily practice, namely, mono-articular arthritis, synovitis, tuberculosis, etc. The recurrent pains which accompany the locking are frequently so negligible that the patient does not lay particular stress upon

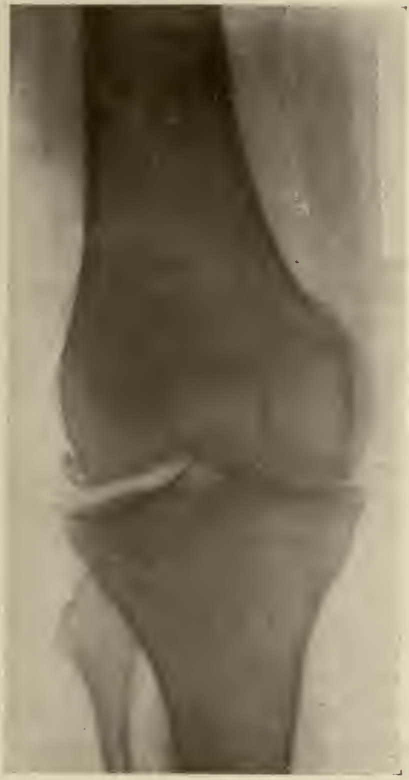

Fig. 294.—Hypertrophic osteo-arthritis of the left knee-joint. Note lipping of external condyle of femur. Note also obliteration of space between the internal condyle of femur and internal tuberosity of tibia, owing to partial destruction of internal semilunar cartilage (Murphy).

them, and the soreness and swelling of the knee-joint is so frequently considered and treated as a traumatic synovitis which subsides in two or three days, leaving no external trace. Another difficulty which is encountered in diagnosis is the fact that the x-ray so infrequently will show the semilunar cartilage. It will, however, serve to rule out other lesions, such as an advanced tuberculosis, Schlatter's disease, deforming osteitis, etc. When a patient presents himself, giving a history of an external trauma or a twisting of the knee-joint, which is followed by considerable pain and swelling, one must at once think of a semilunar cartilage injury. If, in addition to that, we have the history of a locking of the knee-joint and the typical acute pain accompanying it, with the disappearance of this condition after manipulation or rest, then it is quite possible that we have to deal with a fragmented or loosened cartilage. When the locking recurs repeatedly, or when a small body can be felt under the skin internal to the patella, which is not freely movable, then we are justified in making a diagnosis of semilunar cartilage injury.

The treatment of fractured or dislocated semilunar cartilage is surgical. Those men who have had the greatest number of cases have found by experience that bandaging, extension, plaster casts, and all types of appliances have failed to permanently relieve the trouble in such a large percentage of cases that now all are operated on as soon as possible. It is agreed that the best time for operation is from seven to ten days after the original dislocation or repeated attack of the same trouble. Dr. Murphy always taught that an operation upon a joint or upon a fracture of the bone should never be attempted until after there had been a coffer-damming of the tissues about the site of the injury. It was found that at this particular period the tissues best withstand the physical traumatization consequent to an operation. We know from our experience with these cases that immediately after the dislocation or after recurrent pinching of the semilunar cartilage a bloody fluid accumulates in the joint cavity. A week of rest in bed, with extension and application of an ice-cap, will give the tissues sufficient time to recover from the traumatization. The fluid, if still present, is at the end of that time not bloody, but most frequently consists of a clear yellow or white exudate.

In his earlier work along this line it was Dr. Murphy's custom to inject formalin and glycerin solution into the joint after first aspirating the fluid in order that a chemical coffer-damming might be brought about in the joint. This was abandoned after some years—after it was learned that the knee-joint can be opened and the semilunar cartilage removed without touching any of the joint surface with anything more than one or two sterile instruments.

In general, the operative technic followed in this clinic is as follows:

Because of the very great danger and the disastrous results following an infection a thorough preparation of the skin and the operative field is necessary. The patient is placed upon the operating table flat on his back, with his knees flexed over the end of the table and the head and body lowered, essentially a Trendelenburg position. The knees are flexed at right angles to the thighs, as this gives the very best possible position for opening the knee-joint at the semilunar cartilage location. An incision about 2½ inches long is made parallel to and either internal or external to the ligamentum patellæ, as the case may be. After the incision has been extended downward to the upper end of the tibia it is curved outward and almost parallel with the articulating surface of the tibia for a distance of about 1½ inches. This gives almost a right-angled incision, and after cutting through the skin and fatty tissue exposes the true capsule of the joint. A fresh scalpel is used in making the incision through the capsule about on the same lines as the skin incision. This brings one down to the synovial capsule, which is opened with great care, and for the first time we are in the joint cavity. Before beginning the operation it is necessary that a very firm tourniquet, in the form of a large rubber tube or an oversized band, such as is used on the blood-pressure apparatus, be applied high up on the thigh. This prevents all bleeding from the skin and subcutaneous tissue, so that your field is practically bloodless, and it rarely becomes necessary to introduce a sponge into the

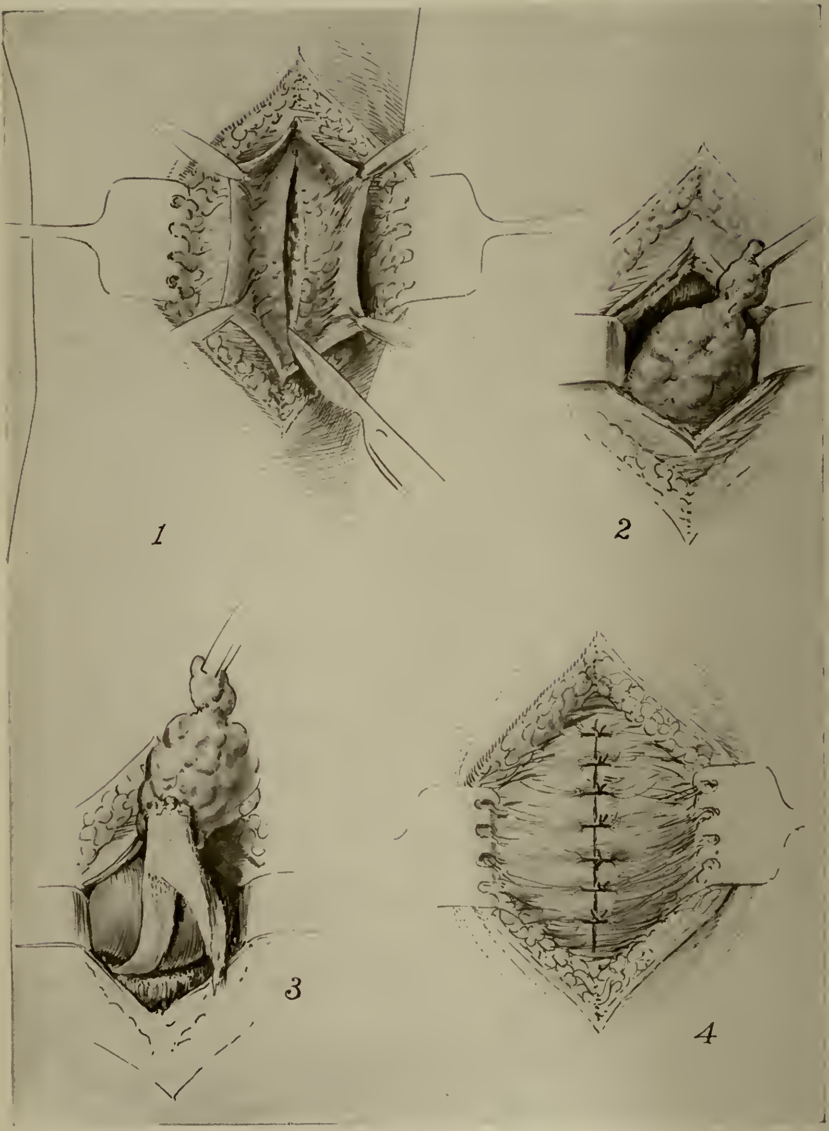

Fig. 295.

wound or into the joint. When the synovial capsule is opened the joint fluid often escapes very freely if the injury has been a recent one. If it is clear synovial fluid the loose or fragmented cartilage may be clearly seen in the field and grasped with a forceps and drawn outward. In the ordinary case a curved scissors frees that portion of the smilunar cartilage which still remains attached with very little difficulty. If any difficulty is encountered at all, an adduction of the leg on the thigh, in the case of an internal semilunar cartilage operation, gives one free access to the posterior portion of the semilunar cartilage attachment. Great care is exercised not to injure the surface of the joint in any way. After the cartilage is removed the edges of the synovial membrane are approximated and sutured with fine catgut. The capsule is closed with catgut and the skin sutured with horsehair and the operation is completed (Fig. 295).

The after-treatment consists in placing the leg into a straight wire cage and applying a Buck's extension with a weight of from 12 to 15 pounds, so as to keep the joint surfaces separated during the process of repair. After twelve to fifteen days active motion is permitted, and at the end of three or three and one-half weeks the patient is able to be up and about on crutches. From the statistics of those men who do careful surgery, and who do a great many operations of this kind, it can be seen that the operation for the removal of the semilunar cartilage in an uncomplicated case is most successful. The absence of the cartilage in the knee-joint interferes in no way with the function of the joint.

Following the technic outlined above we find in the case now before us that the semilunar cartilage has become detached at its anterior end and is fractured very much as shown in Fig, 291, *D*.

Fig. 295.—Operation in a typical case of fracture of internal semilunar cartilage: *1*, Longitudinal incision to inner side of patella. The knife is shown dividing successively the fibrous, the vascular, and the synovial layers of the capsule. *2*, Retraction of edges of wound shows inflamed and thickened subpatellar fatty bursa. Its inner margin is scar-like from the frequent pinching of its villi between the bones. *3*, Upon delivering the fatty bursa the attached semilunar cartilage emerges from its position. *4*, Interrupted sutures opposing edges of capsule (Murphy). (Note: The straight incision shown in the figures was used prior to the adoption of the right-angled incision described in the text.)

We remove the cartilage in its entirety and with it a small loose body which we find just under the patella to the median side. Upon opening the joint a small quantity of free fluid escaped; there was no blood. We close the incision in layers, using our customary precautions against hand-contacting tissues.

The after-treatment which we shall apply here has already been described.

CLINIC OF DR. J. S. EISENSTAEDT

Michael Reese Hospital

MECHANICAL AIDS IN THE DIAGNOSIS OF LESIONS OF THE UPPER URINARY TRACT

Summary: A careful history and a painstaking physical examination of prime importance—mechanical aids valuable for purposes of differential diagnosis; fields of usefulness for cystoscopy, ureteral catheterization, roentgenography, ureteropyelography, and chromocystoscopy.

A GREAT number of reports and many articles have recently appeared in the literature devoted to description and case reports of the various procedures which I wish to discuss this afternoon. You all know the various procedures and the indications for their use. However, in spite of fearing that this subject may have become somewhat worn, I hope to be able to bring some new points to your notice and emphasize the old ones.

Let us first enumerate the mechanical aids which have actually revolutionized the methods of urinary diagnosis:

1. Cystoscopic examination.
2. Ureteral catheterization.
3. *x*-Ray examination.
4. Combination of two or all of the above plus the injection of a fluid or the passage of an instrument which appears opaque in the *x*-ray plate, as:
    - (*a*) Shadowgraph catheters, impregnated with lead or bismuth.
    - (*b*) Placing of metal mandrin in catheter.
    - (*c*) Pyelography, using either 40 per cent. argyrol, 10 per cent. collargol, or thorium.
    - (*d*) Uretography.
    - (*e*) The use of a metal ureteral catheter with resonator attachment for eliciting the presence of stones.
5. Chromocystoscopy.

It is far from my intention to underrate the painstaking history and carefully made physical examination, for without these no man, regardless of how remarkable his technical skill may be, can justly lay claim to the title of surgeon. The clinical evidence and the deductions made possible by our mechanical aids must each be carefully weighed before a conclusion can be reached in a complicated case. But why, then, lay such stress upon the mechanical aids? For the following good reasons:

In the first instance, stone in the kidney may be latent or the symptoms may be referred to the opposite side, or may pass under the guise of lesions of the gastro-intestinal tract or of the genital tract in women, or under the diagnosis of sciatica or lumbago or cholecystitis, and not infrequently may be marked by severe reflex ileus, associated with vomiting and meteorism.

Pyelitis, for example, is likewise very frequently diagnosed falsely on account of symptoms referable to other anatomic structures; cases have been reported by Lindeman, Schlesinger, Cohn, and Reiter in which the diagnosis of neuralgia in the iliac or ischial regions was made, and only later were the symptoms found to be due to inflammation of the renal pelvis. Vanderhoef reports a series of cases of pyelitis in which the clinical course and temperature curve were identical with malaria. Mirebeau has shown that pyelitis may produce symptoms in the female referable exclusively to the genital tract. Langstein reports a case of pyelitis under the guise of a severe meningitis, and Schmidt calls attention to pain in the ileocecal region in these cases.

Pyonephrosis, hydronephrosis, and tumor have equally the same eccentricities, in many cases making them difficult of diagnosis. A case came under my observation within the past three weeks which is especially instructive. The patient, a well-nourished woman, complained over a period of time of pain and fulness in the right renal region. The pains were colicky in type, but never occasioned prostration. The urinary symptoms were not marked nor characteristic. Some pus was found in a catheterized specimen from the bladder. A distinct tumefaction was noted in the right flank, which was absolutely characteristic in location, size, contour, and consistency for kidney. A competent and painstaking internist, after careful physical examination, diagnosed lesion of the right kidney, probably hydronephrosis. The patient came to operation, the kidney was exposed, and found to be normal. The case proved to be an enormous hydrops of the gall-bladder. How could such an error have been avoided? Let me add that a cystoscopic examination had been made and the bladder reported as normal. The diagnosis could have been made had all the procedures indicated been carried out in their proper sequence plus the simple inflation of the colon, which would, in all probability, have shown definitely that they were not dealing with a retroperitoneal lesion, but one within the abdominal cavity itself. Therefore, it has been my practice in all cases where there exists the suspicion of lesions of the upper urinary tract to insist upon having besides a carefully taken history, and urinalysis of twenty-four-hour specimen, including bacteriologic examination, an *x*-ray examination of the entire upper tract, including both kidneys, the entire length of both ureters and the bladder.

I will attempt to point out briefly what, in my opinion, the various procedures demonstrate that may be helpful in diagnosing upper urinary tract lesions.

1. *Cystoscopy.*—In the presence of an absolutely normal bladder lesions of long standing of the upper urinary tract are not common. One may, however, encounter a normal bladder picture in the presence of a simple hydronephrosis, a closed-off pyelonephritis, or a low-grade pyelitis, stone in the renal pelvis, or tumor of the kidney. Therefore, when negative, this must be followed by other procedures when lesions of the upper tract are suspected. In a positive sense cystoscopy is usually very important. For example, a tuberculous ulcer will point to tuberculosis of the kidney almost with unerring exactness. A distinctly swollen, edematous, congested, or gaping ureteral orifice will lead to the diagnosis of a lesion of the corresponding kidney, and a diagnosis of a surgical kidney is readily made if a plug is seen coming from one or the other ureteral orifice. Blood seen coming from one orifice will lead us usually to the diagnosis

of renal tumor or stone. While a complete absence of urinary flow from one side, especially if indigocarmin has been previously injected, will diagnose an obstruction usually due to stone or stricture. A ureteral stone engaged in the orifice is likewise readily noted.

2. *Ureteral Catheterization.*—This is of great value in determining from which side pus or blood originates. By its use one can also detect the presence of a hydronephrosis by watching the urine drop from the distal end, for, instead of the normal rhythmic dripping, a sudden continuous stream is noted. Obstruction of the ureter due to stone or stricture is likewise usually detected with ease. However, one must bear in mind that in a somewhat dilated ureter a stone may offer no obstruction to the passage of the catheter. For bacteriologic examinations ureteral catheterization is absolutely indispensable.

The *x-ray* is likewise of enormous value in confirming our clinical diagnosis as well as revealing conditions which might readily have passed unnoticed. It will show about 98 per cent. of all renal calculi, or practically all except the rare uric acid type. When the urine is alkaline in reaction, the absence of shadow on the roentgen plate excludes a calculus of any composition, for in the presence of an alkaline reaction it is certain that phosphates will have deposited upon a uric acid calculus, making it opaque to the *x*-ray. Often renal stones are latent, for only in 50 per cent. of cases does the typical renal colic occur, while pain without colic is present in 30 per cent. of cases, leaving about 20 per cent. without pain which is at all suggestive. I have remarked above that the pain may be referred to the opposite side, therefore making it essential to examine the entire upper tract on both sides; 90 per cent. of ureteral stones show in the roentgen plate, the numerous extra-ureteral shadows frequently seen being due to phleboliths, calcified lymph-glands, and concretions in the intestinal tract. The differential diagnosis of these I shall presently take up under the discussion of uretography and the use of the shadowgraph and metal ureteral catheter. The *x*-ray is particularly of value when repeatedly used to observe the descent of the stone in the ureter at intervals of two or three days. A dystopic kidney in a clear plate is often diagnosed by this method of examination, while various other anomalies are not infrequently detected, as, for example, horseshoe kidney, and, as one of my lantern slides shows, both kidneys present on the right side. Enlargement of the normal kidney shadow may help in diagnosticating renal tumor or tuberculosis, particularly if calcified areas in the latter show up plainly. The diagnosis of hydronephrosis and pyelonephrosis is likewise facilitated by abnormalities seen in the x-ray plate.

I shall discuss together, for brevity's sake, pyelography, uretography, the use of mandrin in the catheter, and of metal catheters. The procedures, when carried out carefully and with the skill which is not acquired with too great difficulty, are perfectly safe and capable of bringing to us a great deal of valuable information. The chief value of filling the renal pelvis and ureter is to determine whether the respective structures are normal in shape, position, size, and number, and whether or not a suspected shadow lies within the lumen of the ureter or within the cavity of the pelvis. A satisfactory pyelogram will definitely show that certain shadows cannot be renal or ureteral stones because they lie at too great a distance from these parts. They will also show distortion of the pelvic outline due either to inflammatory processes, stone, or tuberculosis, showing a jagged, irregular contour; or the smooth and rounded outline of dilations due to back-pressure from obstruction below. Gall-stones may closely simulate renal stones in symptomatology. The shadows may appear absolutely similar in the x-ray plate; pyelography, however, will enable us to show that the shadows cast by gall-stones lie at a considerable distance from the pelvis of the kidney. Ordahl's technic for intensifying the shadow cast by a stone, either in the pelvis or ureter, is a helpful one. The intensification of the shadow depends upon the deposit of a silver solution, usually 20 per cent. collargol, upon the surface of the stone, thus making it denser to the passage of the x-ray.

When a hydronephrotic or pyelonephrotic pelvis is filled with collargol the x-ray plate should demonstrate besides irregularities in size and the presence of dislocation—usually either laterally or caudally—the origin of the condition; *i. e.*, whether due to malformation of the ureteral mucosa, to bends or twists, to partial obliteration or constriction of the ureter, or to abnormal insertions of the ureter into pelvis. Stereoscopic plates still further enhance the value of radiograms in general, whether made with or without the use of the various substances or instruments introduced. The shadowgraph catheter when placed into the ureter will likewise determine for us whether or not the suspected shadow lies within or without the ureteral lumen; however, in certain instances, for example, in dilated ureters with stone, it does not seem to be as useful as uretography. A mandrin introduced into a ureteral catheter has no advantage, in my opinion, over the excellent shadowgraph catheters which are now obtainable. The use of a metal ureteral catheter is particularly indicated when facilities for roentgen examination are not available. When used with resonator attachment one can detect a metallic click when the proximal tip comes in contact with the stone in the ureteral lumen. To summarize:

1. We have at our disposal various methods of exact diagnosis of lesions of the upper urinary tract.

2. The fields of their usefulness overlap, and each procedure may be made to supplement the other.

3. The use of these mechanical aids does not and should not do away with careful clinical and laboratory methods.

4. Urinalysis and *x*-ray examination at least should be made routine procedures when even the slightest suspicion points toward urinary tract lesions. Often wholly unexpected facts are revealed.

5. The necessity for the use of these procedures lies in the fact that many serious lesions of the upper urinary tract may pass under the mask of various other disease processes and occasion symptoms referable to remote or widely differentiated structures, and, in fact, may for long periods of time remain latent.

CLINIC OF DR. GUSTAV KOLISCHER AND DR. J. S. EISENSTAEDT

MICHAEL REESE HOSPITAL

A NEW METHOD OF ANESTHESIA IN PROSTATECTOMY

Summary: Requisite characteristics of local anesthesia for prostatectomy; topographic relations and nerve-supply of the prostate; flooding the periprostatic plexus—mode of entering the bladder; testing the degree of anesthesia; further injection of anesthetic, if necessary, by the transvesical route.

It requires no argument to establish the desirability of local anesthesia in prostatectomy. The anesthesia, however, must be of such a character as to ensure absolute local insensibility, freedom from physical and mental shock, and an orderly progress of the operative procedure.

From clinical observations and anatomic studies we became convinced that failures in local anesthesia for prostatectomy were due to a misapprehension of the necessary localization and extent of the infiltration used. Moreover, after frequent use of the technic about to be described, we feel justified in asserting that we have developed a procedure which ensures success in the above enumerated points. Our first efforts were directed to a study of the nerve supply of the prostate gland and contiguous structures, especially of the topographic relations. Anatomic studies were carried out in the anatomic laboratory of the Northwestern University Medical School by the courtesy of Professor Ransom.

The sensory nerves of the prostate gland are derived from the prostatic plexus, often a prolongation of the vesical plexus, which lies chiefly on the sides of the gland, between it and the levator ani muscle. Each of the parts, right and left, supplies the prostate and prostatic urethra and sends offsets to the neck of the bladder and to the seminal vesicles. This plexus is made up of nerves of considerable size, which are derived chiefly from the sympathetic system through the pelvic or inferior hypogastric

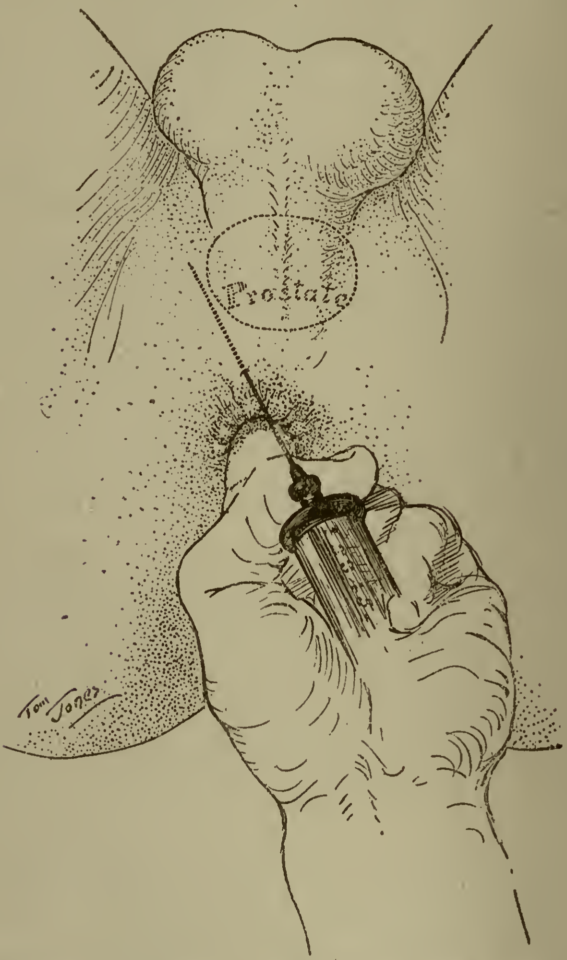

Fig. 296.—Insertion of the needle through perineum under control of finger in rectum.

plexus, and from branches of the sacral ganglia and visceral branches by way of the pelvic splanchnics from the second and third or third and fourth sacral spinal nerves. The vesical plexus presents on either side of the bladder, on a plane with the intramural portion of the ureter, a flat ganglion, from which emanate several ramifications which perforate the bladder wall, surround the vesical end of the ureter, the prostate, and seminal vesicles, and form around each of these organs a secondary plexus, in the center of which are several ganglia, some of the branches of which may be traced across the prostate, the

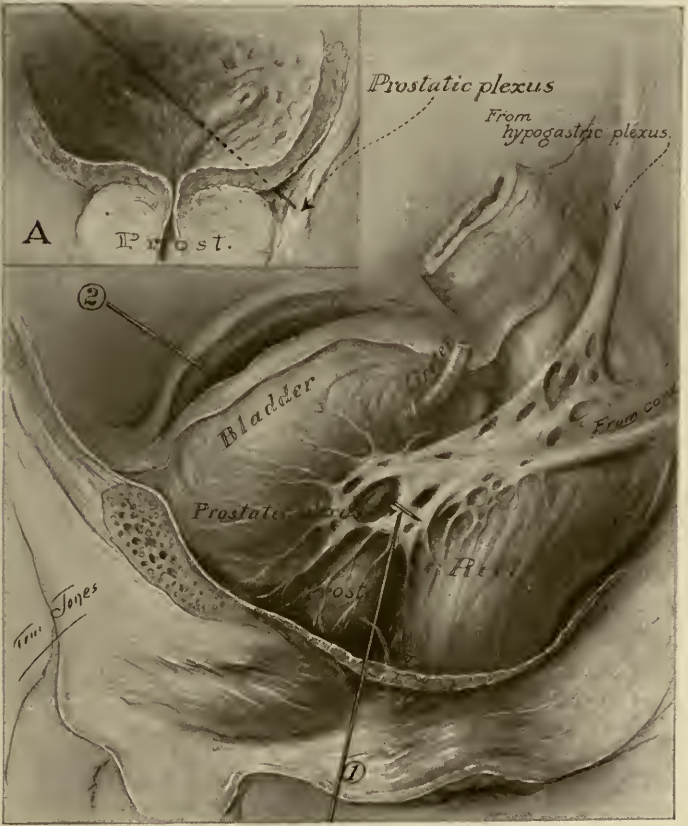

Fig. 297.—Illustrating the topographic relations of the prostate, ureter, bladder, and nerve plexus with needles in position. Needle No. 1 is the needle shown in Fig. 298, as entering the perineum. Needle No. 2 is the needle as shown in insert *A*, and is employed when the infiltration from perineum has been insufficient or incomplete. Note that this needle pierces bladder wall at a point along a line drawn between ureteral and urethral orifices.

adjacent urethra, to the posterior part of the corpora cavernosa.

Based on these anatomic considerations the technic used is as follows: About fifteen minutes prior to starting manipulations connected with the operation a full dose of morphin is administered hypodermically. This not only does away with the mental excitement of the patient, but also obtunds the perception of the discomfort connected with the insertion into the rectum of a rubber bag and the distention of the bladder by injecting into it a 2 per cent. protargol solution containing 4 per cent. of antipyrin. As soon as the patient becomes somewhat somnolent the infiltration anesthesia is started. Its first step is the flooding of the periprostatic plexus, which, as a rule, may be accomplished by injection through the perineum (Fig. 296). A Record syringe, armed with a needle 8 to 10 cm. in length, is used for this purpose. In order to guide the needle one index-finger is inserted into the rectum. the palmar surface facing the

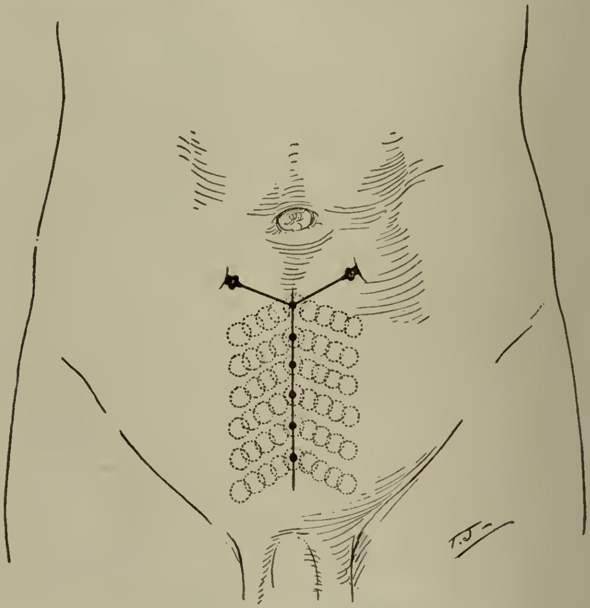
Fig. 298.—Herring-bone infiltration of skin.

lateral pelvic wall. The perforation of the skin is made laterally to the raphé, halfway between the anus and the root of the scrotum. The lateral deviation of the needle from the median plane is determined by the palpatory findings demonstrating the extent of the prostatic tumor, the aim being to bring the point of the needle in close proximity to the plexus on either side of the prostate (Fig. 297). At least 3 c.c. of Schleich solution are injected on either side. Then follows the anesthetizing of the abdominal integumenta. It is insufficient merely to raise the skin in a linear wheal only extending over the linea alba. It is imperative to infiltrate the line of the incision and the adjacent area in herring-bone fashion (Fig. 298) because the structures

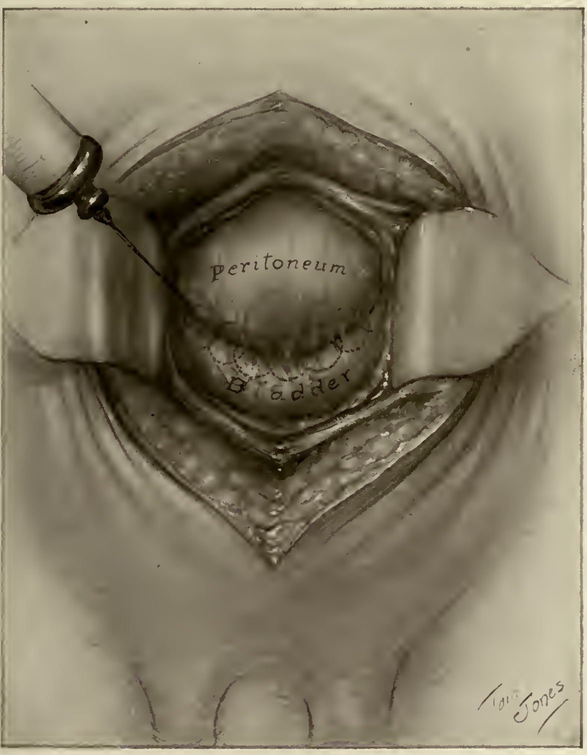

Fig. 299.—Line of infiltration controlling sensation at the attachment of the peritoneum to the bladder wall.

close to the incision have also to be desensitized in order to prevent the perception of pain excited by the insertion of retractors. The same procedure has to be carried out in infiltrating the subcutaneous and subfascial tissues. After the anterior aspect of the bladder with the adherent peritoneal reduplication has been exposed, the infiltration must follow the line of the peritoneal attachment to the bladder wall (Fig. 299). Only in this way will the stripping off of the peritoneal fold be made painless. Now the bladder is opened, and the success of the perineal flooding of the periprostatic plexus is tested by exerting traction on the prostatic tumor by means of a volsellum or a tumor screw. If this perineal flooding has accomplished its purpose, then the pulling on the prostate or the stretching of the posterior urethra will cause no pain whatever. It may also be mentioned that this complete anesthesia is accompanied by blanching of the mucosa covering the prostate.

In case the aforementioned manipulation should cause any pain, the proof is furnished that the periprostatic plexus has not been reached, and, therefore, the anesthesia must be completed by flooding these nerve centers from within the bladder. This is carried out in the following way: The needle perforates the bladder wall from within at a point located on a line drawn from the ureteral opening on either side to the internal urethral orifice. The direction of the needle is forward, outward, and somewhat downward, to ensure again the blocking of the prostatic nerve plexus (Fig. 297). The quantity of anesthetizing fluid used is the same as used in the perineal injection.

CLINIC OF DR. HERMAN L. KRETSCHMER

Presbyterian Hospital

(with presentation of two cases from Alexian Brothers hospital)

BENIGN HYPERTROPHY OF THE PROSTATE AND ITS TREATMENT BY SUPRAPUBIC PROSTATECTOMY

Summary: The history, examination, diagnosis, operative pathology, and post-operative course of four patients; advantages of a comprehensive pre-operative study of patients with hypertrophy of the prostate—the points requiring special care; pre-operative management; choice of methods of treatment for patients with (*a*) residual urine; (*b*) complete retention; (*c*) cystitis; post-operative hemorrhage; benign hypertrophy; chronic prostatitis; carcinoma—the diagnosis and prognosis.

Case I.—This patient that I am going to show you first is a man aged sixty-nine, who was admitted to the hospital ten days ago with the following history:

Six years ago he first had difficulty in passing urine, which difficulty was associated with pain located in the penis during urination. At times he experienced great difficulty in passing his urine, frequently going for several hours without being able to void, and when he did void he was able to pass only a few drops. This urinary obstruction was variable, being worse some days than others. Three years ago the patient experienced severe pains in the urethra, and passed a little blood from the urethra two or three times in the morning, after which the urine appeared normal in color. One year later he again passed a little blood from the urethra. The frequency and difficulty of urination have been present with slight variations, as previously mentioned, ever since the onset of his trouble. For the past five years he has been obliged to arise four or five times at night.

Four days before entering the hospital the patient had a severe attack of hematuria associated with pain in the penis. This gradually became worse, and while at work he passed dark bloody urine and many large clots. The distress increased rather rapidly, and he then had a considerable degree of suprapubic pain and a more or less constant desire to urinate.

Examination shows a small, poorly developed man, weighing 120 pounds. Head and neck are negative. Examination of the chest reveals the presence of many râles, anteriorly and posteriorly, and a slight mitral systolic murmur is heard over the apex.

Examination of the Abdomen.—A round prominent swelling is present in the lower part of the abdomen extending from the symphysis pubis to the umbilicus. This swelling is very sensitive, and on percussion is flat. In the right inguinal region there is a swelling the size of a hen's egg. It is not tender. This, he says, has been present for five years. The external genitalia are negative.

Rectal Examination.—The prostate is only moderately enlarged. The surface is smooth. No areas of tenderness. Rectal examination was not painful. The seminal vesicles are negative.

Examination of the urine shows the presence of blood and pus; no sugar; a trace of albumin.

From the findings and the history a diagnosis of enlargement of the prostate with retention of urine and an intravesical hemorrhage was made. A metal catheter was passed into the bladder for the purpose of relieving the retention and irrigating his bladder, after which a cystoscopic examination would be in order. The catheter entered the bladder easily, but no urine flowed from it. After much manipulation a small clot was removed, so that it was evident that this patient was having, at the time of his admission to the hospital, an extensive hemorrhage into his bladder, and because of the impossibility of removing the clots and distending the bladder a cystoscopic examination was out of the question. The condition was explained to the patient, and he was advised that a suprapubic cystotomy under local anesthesia was the best way out of this situation.

Accordingly, under local anesthesia the patient's bladder was opened suprapubically. The entire bladder was filled with large masses of blood-clots. After removing the clots and irrigating the bladder, large retractors were introduced into the bladder for the purpose of inspection. Examination of the interior of the bladder showed the presence of a moderate degree of enlargement of the lateral lobes and a very prominent middle lobe that projected into the bladder much like a small uterus. Running down the posterior aspect of this middle lobe was seen a large tortuous vein that had ruptured and from which the bleeding had taken place. Rupture of varicose vessels in the bladder is extremely rare. This is the second time that I have seen a patient who had ruptured varicose veins, and in both instances the condition was associated with an enlarged prostate. The bladder was packed tight with iodoform gauze and the patient placed back in bed.

This is one of the rare instances in which cystoscopy preliminary to prostatectomy was not carried out, and in which we were unable to carry out a phenolsulphonephthalein test for renal function.

One week after the preliminary cystotomy a suprapubic prostatectomy was performed under sacral anesthesia, the anesthetic having been administered for me by Dr. Malcolm L. Harris. The time of operation was seven minutes. Two lateral lobes and a large median lobe were removed. The dissection was clean and there was only a small amount of hemorrhage. Two gauze packs were inserted into the cavity from which the prostate was removed. Half the gauze packing I removed the first twenty-four hours after the operation. The remainder of the packing I removed at the end of forty-eight hours. In ten days the patient voided through the urethra and the wound closed in fourteen days. He was discharged in eighteen days from the time of his prostatectomy.

The case is interesting because of its being in the nature of an emergency, and in view of the fact that we were not able to do a cystoscopy and carry out our usual kidney function tests before operating. The thalein test, carried out after the cystotomy and before the prostatectomy, showed an output of 58 per cent.

Case II.—The second patient that we have is Mr. E., aged sixty-five, who gives the following history:

For the past four years the patient states that he has noticed a gradually increasing difficulty in passing urine. He has had frequency both day and night, being obliged to rise three or four times at night. Two or three months ago the symptoms became very much worse, so that he was obliged to rise four or five times at night and had considerable difficulty in starting the stream, so that he was obliged to strain a good deal, which caused him considerable pain. At this time he consulted a physician, who performed a double vasotomy for the relief of the urinary trouble. This operation has not given him any relief. Two weeks before entering the hospital the pain on urination became excruciating and he could void only small drops of urine at a time. His urine at this time, he states, was very turbid. He consulted a physician, who told him he had cystitis. There has been no hemorrhage from the urinary tract. The patient has lost a good deal of weight.

Examination.—Elderly white male, poorly developed, aged sixty-five. Head is negative. Many teeth are missing, and those remaining are in very bad condition. Neck is negative. Chest shows a few moist râles in the base of both lungs posteriorly. Examination of the heart shows it to be irregular and the apex-beat very feeble. He was referred to the medical side and examined by Dr. H. Klein, who reports the following:

"Beginning dilatation of the left ventricle and a reduplication of the first sound. Considerable arteriosclerosis. Diagnosis of myodegeneratio cordis. Four subsequent blood-pressure examinations revealed the blood-pressure to vary from 128 to 132. Advised against the use of a general anesthetic should we decide to operate upon him."

The abdomen is negative. He has a left indirect inguinal hernia of seven years' standing. The external genitalia are negative. The scrotum shows the scars of his previous vasotomy operation. The prostate is not distinctly enlarged. It is round, prominent, and firm in consistency. Two very small lateral lobes can be felt.

Cystoscopic Examination.—A generalized cystitis with a good deal of trabeculation. In the apex of the bladder is seen a large diverticulum. A well-defined prostatic notch was seen above. At the base of the bladder was seen the presence of a large median lobe. Examination for residual urine revealed the presence of 130 c.c. Cultures of the residual show the presence of staphylococci and Bacillus coli. The phenolsulphonephthalein test, intravenous injection, showed the time of appearance to be six minutes. Elimination during the first half-hour was 50 per cent., and during the second half-hour was 10 per cent. Total elimination one hour, 60 per cent. Blood-pressure, systolic 140 and diastolic 90.

Because of the patient's bad general condition it was decided to do a two-stage prostatectomy. Accordingly, one week ago the bladder was opened under local anesthesia, using novocain, and a large drainage-tube inserted. Since then the patient has reacted very nicely. He is now ready to have his prostatectomy, which we will perform under sacral anesthesia because of his impaired heart and lung condition.

The sacral anesthesia was administered for me by Dr. M. L. Harris. Our usual suprapubic operation will be carried out. The finger is inserted through the suprapubic wound and the actual enucleation proceeds rapidly without much difficulty. The prostate is now freed and removed with forceps. The cavity from which the prostate has been removed will be packed with iodoform gauze.

Examination of the specimen shows the presence of two minute lateral lobes, each one not larger than a very small hazelnut, but here you see the presence of a well-defined large pedunculated middle lobe, so that every time the patient attempted to urinate this large lobe would fall over the internal urethral orifice and close his bladder neck (Fig. 300).

Removal of the prostate required four minutes. Sections will be made from the right and left lobes as well as from the median lobe to see what type of enlargement we have. We have no difficulty, as a rule, in enucleating these small prostates, and I have given up doing them by the perineal route. I find I can remove them just as easily from above as from below.

Postscript.—Two weeks after the operation the patient voided urine through the urethra and his wound has been dry. Examination before leaving the hospital reveals the following: His wound is healed, and the patient is obliged to rise only twice at night. The urine is clear. Cystoscopic examination shows that the prostate has been entirely removed and there is no residual urine.

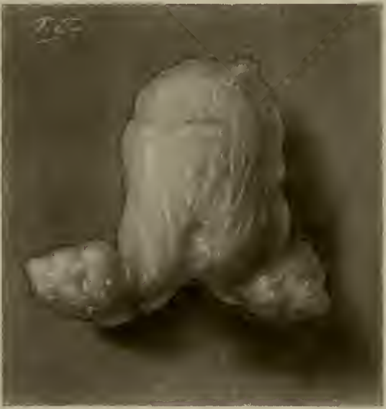

Fig. 300.—Case 2: Showing the large broad middle lobe and the two minute lateral lobes.

Case III.—Mr. E. K., aged sixty-eight, referred by Dr. Billings. For the past two or three years the patient has had frequency of urination, being obliged to rise from three to four times at night and voiding every two hours during the day. He has had no difficulty in starting the stream outside of being obliged to strain after exposure to wet and cold.

In November, 1916, the patient was seized with very severe pain, which he states was knife-like in character, passing through the urethra. This pain was so severe that it almost took his breath. The pain diminished after a few moments, so that he could go in his car to see a physician.

Three weeks before entering the Presbyterian Hospital the patient had severe painful urinations, frequency of urination, and tenesmus. The pain was located in the glans penis and was so severe that the patient was obliged to take morphin. His home physician treated him with irrigations without relief.

Rectal examination shows a flat prostate, slightly irregular on the surface, not hard, no areas of tenderness, and the prostate is not enlarged. Cystoscopic examination shows a mild generalized cystitis. There is no sign of lateral lobe involvement. At the base of the bladder is seen a well-defined prostatic bar that forms a notch on the left side of the orifice about one-third the way up. A similar notch is seen on the right side, but lower down. Residual urine, 120 to 160 c.c. Examination of the urine reveals the presence of pus and staphylococci.

A second cystoscopic examination made one week later shows the presence of essentially the same condition as that noted at the first examination.

The patient was treated with sitz-baths, hot wet applications, and bladder irrigations of warm potassium permanganate solution. The irrigations were followed by insertion into the bladder of argyrol, 20 per cent. Palliative measures have failed to relieve the patient. His pain and the residual and turbidity of the urine are just the same today as they were at the time of his admission to the hospital.

The question of operative interference has been gone over, and it was decided to perform a suprapubic prostatectomy. Owing to the general condition of the patient (he has a very severe paralysis agitans), a prostatic punch operation was first considered. At a subsequent consultation it was decided to perform a suprapubic prostatectomy rather than a punch operation.

The patient is receiving an ether anesthetic, there being no contraindications for ether in this case. The bladder has been filled with boric solution, so that we are ready to operate upon him. The usual suprapubic incision is made through the skin and deep fascia, the sheath of the rectus opened, and the rectus fibers separated by blunt dissection. The prevesical fat is stripped back off the bladder with a gauze sponge and the bladder comes into view. The bladder is picked up with two silk sutures and an incision 3 inches long made in the bladder high up. After removing the fluid, large retractors are put into the bladder for the purpose of inspection. At the internal urethral orifice is seen a well-pedunculated middle lobe. No lateral lobes are seen. A suprapubic prostatectomy will be performed, removing both lateral lobes and the pedunculated median lobe. Although the lateral lobes cannot be seen projecting into the internal ureteral orifice, it seems to me that a radical removal of the entire gland should be carried out to prevent any other obstruction taking place later.

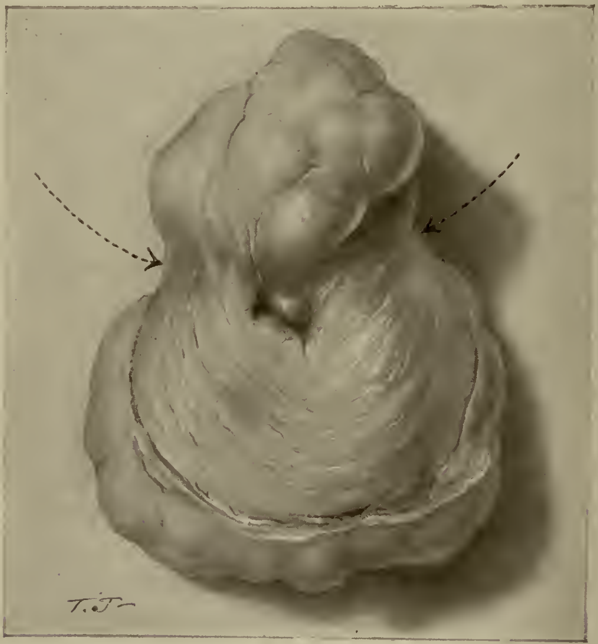

Fig. 301.—Case 3: Prostate after removal. Note constriction produced by the internal sphincter.

The prostate is enucleated in four minutes from the time we made the skin incision. A hot laparotomy pad is placed in the cavity, which controls all the bleeding. The bladder is sutured with catgut; the sutures do not include the mucous membrane. A small rubber drainage-tube is fastened into the bladder with a catgut stitch, the sheath of the rectus is closed with catgut, and a small strip of iodoform gauze is placed into the space of Retzius. The closure of the skin is with silkworm-gut and silk.

Examination of the specimen shows the presence of two small lateral lobes. Each one is as large as a hazelnut without the hard shell. The median lobe is as big as a whole hazelnut. It is fairly well pedunculated, and because of this well-defined pedicle it is easy to see why with the cystoscope we obtained the impression that this was a prostatic bar and not a median lobe, because, when the cystoscope was introduced into the bladder and pushed down across the middle lobe, moving it down toward the base of the bladder, one had the impression that this was a median bar and not a median lobe, so that after all it seems to me that we were justified in doing a radical prostatectomy and not a punch operation (Fig. 301).

Case IV.—E. H., aged fifty-seven. Duration of trouble three years, beginning with obstruction to and frequency of urination. The patient states that as far back as twenty-five years ago he first noticed that the stream lacked force, that the urination was prolonged, and that a slight obstruction seemed to be present. Three years ago the obstruction became worse, the stream became smaller, and lacked force. Since then his trouble has been getting steadily worse, until now he often has great difficulty in urinating because of the obstruction. Two years ago he would have to get up occasionally at night to urinate, and this has been present ever since. Two weeks ago the frequency of urination suddenly became a very prominent and most distressing symptom, the patient being obliged to urinate every hour during the night and day and being able to void only from 1 to 2 ounces. In January the patient had a similar attack of frequency, though much less in severity. For six weeks the patient has had severe pain in the shaft of the penis during and following urination. The patient also complains of constant pain in the rectum, which is more marked at some times than at others, and which is always aggravated after urinating.

Four weeks ago, while straining at urination, he was suddenly seized with a severe pain in the abdomen. He had a slight spasm of the abdominal muscles, and during this he felt something give way in the lower right quadrant of the abdomen, where a mass developed which, upon examination, is now revealed as an inguinal hernia.

Four years ago he discovered the presence of sugar in his urine. Sugar has been present ever since. At one time he was told that his urine contained 3 per cent. sugar. Since then he has been on a diet more or less, and when he adheres strictly to the diet his sugar disappears.

Physical Examination.—The patient is a well-developed, well-nourished white male. Head and neck are negative. Heart, lungs, and abdomen negative. Cystoscopic examination shows a generalized cystitis and a very marked trabeculation of the bladder and two very large prostatic lobes, forming a distinct notch above. No stones or tumors seen. On rectal examination, two enormously enlarged prostatic lobes are felt. The surface is smooth and not tender. Seminal vesicles are negative.

Examination by Dr. Woodyatt.—Blood-pressure, 164 systolic and 104 diastolic. Pupillary and all other reflexes O. K. There is a slight nasal catarrh. Tonsils are submerged. Heart: Left border at mammary line, fourth interspace, 13 cm. to the left of the midsternum. The right border in the fifth interspace and 15 cm. to the right of the midsternal line.

Blood Examination.—Leukocytes, 6300; hemoglobin, 88 per cent.

Examination of the blood shows the following: Sugar, 1.83 mg. per 10 c.c.; urea nitrogen, 27.4; creatinin, 1.6.

The phenolsulphonephthalein test: First half-hour, 32 per cent.; second half-hour, 15 per cent.; total, 47 per cent. Time of appearance, six minutes.

Roentgen-ray examination for stone in the urinary tract negative.

Owing to the fact that the patient had severe distress and severe pain and great frequency, and because of the fact that catheterization had to be carried out regularly, a preliminary suprapubic cystotomy was made. It seemed to me a good plan to relieve his bladder distress, during which time his diabetic condition could be managed. The first specimen of urine upon admission showed the presence of sugar. Since then, upon management, his urine has been sugar free. Suprapubic cystotomy was done ten days ago, and this morning we will remove the prostate. The right index-finger is introduced into the suprapubic opening and the left index-finger into the rectum. The prostate is enucleated in six minutes. There is a rather large amount of bleeding, which will be thoroughly controlled by packing iodoform gauze into the cavity from which the prostate was removed. The wound is closed in the usual manner with silkworm-gut sutures.

During the past ten years there has been a steady and progressive diminution in the mortality rate of prostatectomy. This has been obtained in part by a careful and thorough preoperative study of each case, as well as by refinements in anesthesia and operative technic. We believe that a comprehensive preoperative study in the case of a patient with hypertrophy of the prostate should include the following:

(1) An accurate diagnosis of the local condition at the vesical orifice and the determination of the presence or absence of other lesions in the bladder, such as tumors, calculi, diverticula, etc.

(2) A careful study of the renal function.

(3) A rather careful, comprehensive differential diagnosis.

As I think of the many things accomplished by a preoperative study, the one that stands out prominently is the fact that it has led to a better preparation of the patient. Furthermore, it is well known that the mortality rate in cases operated upon within a day or two after admission to the hospital is very high and that this mortality is usually due to uremia.

Another distinct advantage of thorough preoperative study is that it admits of a rapid prostatectomy. I am a great believer in rapid operating in these old men. It does not seem reasonable to me that one shall fool away as much time as he wishes in operating upon men of advanced years who have bad hearts, bad arteries, etc. The average time consumed in removing a prostate should not be more than seven or eight minutes from the time of beginning the skin incision until the prostate has been enucleated. By rapid prostatectomy is not meant rough or careless operating. There can be no question that the less anesthetic these patients are subjected to the better. Statistics show that pulmonary complications still cause about 10 per cent. of the fatal terminations, and it seems reasonable, therefore, that a patient in whom the entire operation consumes from five to seven minutes is less liable to pulmonary complications than is one in whom the prostatectomy consumes an hour or more. For this reason we believe that sacral anesthesia has a definite field of usefulness, as is the case with gas-oxygen anesthesia in certain cases. As a routine we do not have one anesthetic, but we rather select the anesthetic that we believe is the best suited to the individual patient. The three anesthetics that we use are ether, gas-oxygen, and sacral, the sacral being preferred to the so-called spinal anesthesia.

The value of cystoscopy in this group of cases cannot be questioned. Of the various diagnostic measures that are at our command, it is the one giving us the most information and sometimes information that cannot be obtained in any other way, as in the first case operated upon this morning, where the patient obviously had the symptoms of a prostatic obstruction and residual urine, yet rectal examination showed a small prostate and one that impressed me as being about normal in size for a man of his age. Cystoscopic examination, however, demonstrated the presence of a well-defined middle lobe, and that this was the cause of his obstruction is proved both cystoscopically and by operation. By means of the cystoscope, therefore, one may ascertain the type of enlargement of the prostate as well as the presence or absence of a coexisting lesion in the bladder, and, furthermore, one may definitely decide upon the route of approach and the type of operation to perform. In this way much valuable time is saved at the time of operating that would otherwise be spent in needless exploration. In other words, having cystoscoped this patient this morning, and knowing that there were no other conditions in the bladder, it was a simple matter for us to enlarge his suprapubic wound, making it just large enough to admit the index-finger, by means of which the prostate was enucleated. In a case in which no preliminary cystoscopy is done it becomes necessary, of course, to make a long bladder incision, to introduce retractors, and to see what complicating condition may or may not be present in the bladder. All these things take time, and it seems that the time of operating should be reduced to a minimum.

Doubtless one of the biggest factors in reducing the mortality rate has been the study of the renal function. Renal insufficiency still heads the list of the causes of death following prostatectomy. It is generally acknowledged that routine employment of the functional tests has aided in reducing the mortality rate. Study of the renal function has also contributed in a measure to the so-called preliminary treatment. These patients being old men very often have many other things the matter with them besides their urinary trouble, so that each patient must necessarily be subjected to a complete physical examination, which should include a careful study of the blood, urine, blood-pressure, roentgen-ray examination, and a thorough examination of the heart and lungs. Doubtless in some of these obscure cardiac cases much valuable information may be obtained by the use of the electrocardiograph.

The preoperative management, in the main, consists of local treatment which has for its object:

(1) The improvement of renal function.

(2) The relief of back-pressure on the kidneys.

(3) The elimination of the infection from the bladder.

By improving renal function as much as one can, we prevent or reduce to a minimum the postoperative complications due to renal insufficiency. We instruct our patients to drink water regularly and to drink definite amounts. At times it may be desirable to administer as much as 4 or 5 liters in twenty-four hours. This, however, must not be a hard-and-fast rule, but must be an elastic one. For example, in some of our cases the patients were suffering from a severe organic disease of the heart with associated evidence of broken compensation. Obviously to tax an already overburdened heart would not be the most desirable method of procedure, but in a case in which the heart will permit we believe that the use of large quantities of water, given in definite amounts and at definite times, is a very desirable procedure.

The relief of the back-pressure on the kidneys and the relief of infection may be discussed together. The one fact that stands out prominently in the management of cases of benign hypertrophy of the prostate is this one, that each case is a problem in itself, and demands, therefore, individual management, so that we believe that these cases must be selected and managed as individual cases, and that a hard-and-fast rule cannot be put down to apply to these patients as a group or as a whole. The majority of patients who come to us suffering with benign hypertrophy of the prostate have residual urine, which varies in amount often from several ounces to a pint or more, and not infrequently these patients come to us suffering from complete retention. To the elements of residual and retention must be added a third element, that of infection, which is so often present. The handling of these three elements is the problem of the local management of the bladder.

In managing the bladder one may proceed in one of three ways:

(1) By the regular and systematic use of the catheter.

(2) By the use of the in-dwelling catheter.

(3) By suprapubic drainage.

In a certain number of cases it is often possible to get along very well by the use of the catheter, each catheterization to be followed by an irrigation. Both catheterization and irrigation must be done, of course, under the strictest aseptic conditions. Too much stress cannot be laid upon this fact. We are all familiar with patients who use a catheter that they carry in their pocket, and we are also familiar with the many doctors who use catheters without boiling them, and who, therefore, fail in their instructions to the patients, not giving them the necessary instructions regarding asepsis. At times patients may not tolerate catheterization, so that each attempt to catheterize and irrigate is followed by severe urethral pain and often by chills and fever. Not infrequently patients tire of catheterization, so that they discontinue it. It is perfectly clear, therefore, that catheterization, while it can be carried out generally, in a large number of cases, cannot always be carried out in clinic patients because they will not co-operate.

Second, the permanent or in-dwelling catheter. When this procedure is possible, good, efficient bladder drainage is established. The presence of the catheter, however, may result in the production of more or less urethritis associated with pain, so that after a longer or shorter time it becomes necessary to remove the catheter. Bleeding in considerable amounts may also interfere with the carrying out of this treatment.

Third, suprapubic drainage. This may be carried out either by suprapubic puncture or by an open operation. Suprapubic puncture has one very serious drawback in spite of its apparent simplicity; that is, the danger of injury to the peritoneum with a resulting peritonitis and death. I have seen one such case in which a young man was sent to my clinic who had had two or three attacks of complete retention of urine. His local physicians were unable to catheterize him and performed a suprapubic puncture and sent him to Chicago. I succeeded in passing filiforms and in re-establishing urethral drainage. The next morning after the patient had been admitted to the hospital a peculiar fecal-like odor was noted upon the dressings that had been placed over his suprapubic puncture. The advice was to operate immediately, the diagnosis having been made of injury to the bowel. This the patient refused, and he died shortly after. It is a simple procedure to plunge a trocar into a bladder distended as high as the umbilicus. While in theory the peritoneum is entirely away from the anterior aspect of the bladder in this type of case, nevertheless there are cases in which the peritoneum is firmly adherent low down on the anterior wall of the bladder, so that when the bladder rises the peritoneum is not carried away. It seems to me, therefore, that the more rational and safe procedure is the performance of a suprapubic cystotomy under local anesthesia. For the purpose of drainage one may use either a large catheter or a tube. I prefer a tube. With the establishment of bladder drainage, the process of flushing the kidneys by the administration of a large amount of water can be carried out. Irrigation can be now commenced, irrigating directly through the urethra or through the suprapubic drain.

One is often asked the question, How long should the preliminary treatment be carried out before undertaking the prostatectomy? It is certainly clear that there can be no definite answer to this question. The entire question of prostatic hypertrophy divides itself into an individual problem; that is, each case is a law unto itself and must be managed as such. In some of the cases suprapubic cystotomy was carried out and the prostatectomy was never done, the patients having died from intercurrent disease; for example, cardiac failure. In determining when the second operation should be carried out, one can be guided by some method of estimating the renal function. Our experience has been almost entirely limited to the phenolsulphonephthalein test. However, we do not rely absolutely on the figures obtained in carrying out the test. I believe that the test should be a part of the gross clinical evidence. When a low reading is obtained by this test, the patient is put upon the previously mentioned management. At the end of four or five days the test is repeated, and where these tests are repeated again every four or five days it is surprising how a patient who came in with a low total output will rapidly improve under management. Then, if the figures obtained after a careful, systematic preliminary treatment are not up to the normal figures, but if the figures show improvement, and if they remain constant, so that we may assume that the renal function has been improving up to a point beyond which it cannot be improved, we then proceed with a prostatectomy. Nor do we rely entirely upon the use of the dye-test. I believe that certain clinical phenomena may also be used as criteria in conjunction with the tests. We are all familiar with patients in whom an apparently simple suprapubic cystotomy has been performed under local anesthesia who show signs of renal insufficiency. The insufficiency is usually transitory, yielding to judicious treatment. The tongue again becomes moist, the patient improves, the appetite returns to normal, and the output of urine increases. When this has occurred we believe one may safely remove the prostate.

Removal of the prostate after a preliminary cystotomy should be a matter of but a few minutes; at the very outside five minutes are all that are required, and very often the prostate can be removed in three or four minutes. The performance of a rapid prostatectomy has many advantages. The amount of anesthesia is small, and hence the danger of pulmonary complications is reduced to a minimum. Bronchitis and pneumonia are still among the factors responsible for a large number of the prostatectomy deaths. The gastric disturbances accompanying this short anesthesia are practically nil, so that the fluid intake and nutrition so important in these cases are not interrupted. When sacral anesthesia is used or gas this factor is completely removed. In the two-stage cases, therefore, there is practically no interruption in the convalescence from their suprapubic cystotomy. Patients who have had preliminary bladder drainage, requiring as they do but three or four minutes of anesthesia, are not so apt to develop pulmonary complications as are patients who have had an anesthetic lasting an hour or more. As I said before, this is one of the advantages of the previously mentioned preliminary observation, which should include a careful cystoscopic study of each case, thereby permitting of rapid removal of the enlarged gland.

The selection of any particular type of operation or route of approach will depend in part upon the local pathologic conditions present and in part upon the operator's familiarity with one type of operation or another. Doubtless those who have had more experience with the suprapubic operation can obtain better results than they could with the perineal, and the reverse is true with a man whose widest experience has been with the perineal operation.

There is one thing that I do like to talk on, and that is the question of management of hemorrhage in these cases. I am a firm believer that one should control the hemorrhage completely and absolutely. It is a well-known fact that many of these patients have rather sharp hemorrhages. I believe in packing the cavity from which the prostate has been removed, and as a routine in my two-stage operations I pack the cavity with large strands of iodoform gauze if there is any doubt in my mind that they are going to bleed. In some of the cases, particularly where one makes a clean enucleation, there is not much bleeding. In these cases a large drainage-tube is sewed into the bladder, which is removed at the end of twenty-four or forty-eight hours. So, whenever there is the least suspicion in my mind that the patient may bleed, or that the bleeding at the time of operation is not controlled by pressure when a gauze pad is introduced into the wound, we pack, and we pack with enough gauze to completely control the hemorrhage. Other methods besides packing are in vogue, such as the use of the Hagner bag and the transplantation of fat, but I think that gauze packing is better adapted to the usual run of cases.

Before concluding it might be well to call attention to the fact that there is still room for improvement in the diagnosis of benign hypertrophy. A great deal of confusion still exists in the minds of many men as to just what constitutes hypertrophy. This I think is due to the rather loose use of the word. For instance, we are told that a patient of twenty-two or twenty-three is suffering from hypertrophy of the prostate. These cases are nearly always cases of chronic prostatitis, so it is necessary to differentiate between benign hypertrophy and chronic prostatitis. This may be a little more difficult when the patients are nearing the prostatic age. After having definitely determined the fact that we are dealing with an enlargement of the prostate, our next question for consideration is whether or not it is carcinoma. This is not always easy to do. Carcinoma was formerly looked upon as a rare lesion of the prostate. Carcinoma is found more often and is more frequent in its occurrence than was formerly supposed. Because of its point of origin and because of the late development of symptoms much valuable time is lost, or most of the cases are seen too late to have good radical treatment carried out. The diagnosis is comparatively easy in cases in which not only the prostate but the seminal vesicles and even the perirectal structures are involved by the cancer. The adenomatous prostate is usually soft, whereas the cancerous prostate is hard and indurated. Cystoscopic examination is often of value in making the diagnosis in cancer, because there is an absence of the intravesical protrusion seen in benign hypertrophy, and in the late cases one may see the carcinoma growing from the prostate into the bladder. Rectal examination with an instrument in the urethra may reveal the presence of the infiltration. Obscure pelvic pain in old men is of sufficient importance to warrant an examination of the prostate. It must not be forgotten that cancer of the prostate has a predilection to produce bone metastases. Spontaneous fractures and obscure intercostal neuralgia in men with symptoms of bladder trouble should always suggest the possibility of cancer of the prostate. No differential diagnosis is complete without excluding disease of the central nervous system. We are familiar with patients who have tabes and other lesions of the central nervous system, and are operated upon or sent to us for operations for benign hypertrophy of the prostate, when their bladder symptoms are part and parcel of lesions of the central nervous system.

CLINIC OF DR. GEORGE E. SHAMBAUGH

Presbyterian Hospital

I. CARCINOMA OF THE MAXILLARY SINUS

Summary: Transillumination in suspected sinus trouble; comparative value of the skiagraph; puncture of the nasal wall of maxillary sinus—location of choice—precautions to be observed; tardy diagnosis of carcinoma in present case.

II. CHRONIC EMPYEMA OF THE NASAL ACCESSORY SINUSES

Summary: The diagnosis of chronic sinus infection and the identification of the seat of the disease; acute inflammation in nasal chambers the usual source of sinus infection; treatment; drainage essential; advantages of intranasal operations; end-results.

III. SUPPURATIVE OTITIS MEDIA WITH PARALYSIS OF THE EXTERNAL RECTUS

Summary: Examination of case and the operative procedures undertaken; control of hemorrhage from the internal carotid; paralysis of the external rectus a complication of mastoiditis; its course and duration.

IV. CHRONIC INFECTION OF THE SUBMAXILLARY GLAND

Summary: A patient with recurrent attacks of painful enlargement of the submaxillary gland and its duct; chronic tonsillitis—its probable etiologic relation to the submaxillary adenitis.

V. CHRONIC EMPYEMA OF THE MAXILLARY SINUS

Summary: The diagnosis and treatment; satisfactory drainage obtained through middle meatus.

VI. LUDWIG'S ANGINA

Summary: Signs, symptoms, and treatment in present case.

CASE I. CARCINOMA OF THE MAXILLARY SINUS

The case is that of a man aged sixty who consulted me last July. His sole complaint was of a sensation of pressure on the right side of the face. This, he claimed, had annoyed him only a few weeks and had first appeared during an acute head cold. He did not complain of any increased nasal discharge. He recalled an attack of maxillary sinus infection from which he had suffered forty years before. Since that time he had not been troubled with any nasal symptoms nor any annoyance in the region of the right maxillary sinus until the development of the present trouble.

Examination disclosed no external evidence of trouble in the region of the right maxillary sinus. The nasal passages were quite clear and entirely free from any of those alterations usually associated with a chronic accessory sinus empyema. The region of the middle meatus was carefully inspected by lifting up the free edges of the concha media, but nothing was detected which suggested a possible sinus infection. The upper molar teeth on the right side were quite bad, and presented conditions frequently found when they have been the cause of chronic maxillary sinuitis. Transillumination found the frontal sinuses quite clear on both sides. The left maxillary sinus was also clear, but a deep shadow was discovered over the right side. This was the only evidence found indicating that the symptoms complained of had their possible origin in the maxillary sinus. One not infrequently sees cases where sensations of discomfort or even pain are complained of over the region of the maxillary sinus where no trouble whatever is found in the sinus itself. The transillumination test is of great value in examining cases suspected of either frontal or maxillary sinus trouble. In the majority of cases where the sinuses are free the fact can be established by the use of this test alone. In cases where, by this test, the sinuses are found quite clear, it is not necessary to make further examinations. There are, however, not a few cases where one will be left in doubt after the use of the transillumination test. These are the cases where the sinuses are found to be not clear. In such cases a more complete examination of the sinus is called for. It is here that the skiagraph will frequently be found to be of greater value than the transillumination test. This applies to the frontal more than to the maxillary sinuses for the reason that a shadow over the frontal sinus is often caused by the presence of a very small sinus. With the skiagraph not only the size of the sinus can be shown, but a very good idea can be obtained from the plate as regards the contents of the sinus. When it is the seat of acute or chronic empyema, this is shown, as a rule, very clearly in the skiagraph. As regards the maxillary sinus, the skiagraph is of less value. In the first place, extreme variations in the size of this sinus are exceedingly rare as compared with the frontal sinus, and, in the second place, it is a comparatively simple matter to examine the contents of the maxillary sinus by simple irrigation.

On the strength of the shadow over the maxillary sinus discovered by transillumination it was decided to puncture the nasal wall and irrigate the sinus. There are two places where this puncture can be made. One is well up under the inferior turbinated body, $\frac{1}{2}$ to $\frac{3}{4}$ inch from the anterior end of this structure. A straight needle is used, and care must be taken that the force used to push the point through the bony wall does not also drive the needle across the usully small space separating this point from the orbit. The other location for introducing the needle is in the middle meatus, a little posterior to the middle of this space. This is usually the location of choice for the reason that in this region is located the so-called nasal fontanels, spaces where the bony partition wall separating the nasal cavity from the sinus is lacking, and it is only necessary to force the needle through a delicate membranous partition. A straight needle cannot be used for the reason that it would pass directly into the orbit instead of the sinus. Specially curved canulas are required. The best one is the Killian maxillary sinus canula. Care must be taken to place the point of this instrument not too far above the upper border of the lower turbinated body, and to direct the point as much downward as outward in order to avoid entering the orbit. Often the point enters the sinus with very little force or even passes directly through the normal or an accessory opening of this sinus. Irrigation should always be started very cautiously, and if the patient complains of pain in the eye, the needle should at once be withdrawn. It is not possible to be sure that the point of the needle may not have entered the orbit.

In the case of this patient the puncture was made in the middle meatus, and on irrigation clumps of thick mucopurulent secretion were washed out. The character of the secretion washed from the sinus was not like that found in cases of chronic empyema, but was rather the type of secretion that is usually found in the maxillary sinus after the subsidence of an acute sinus reaction which is not infrequently associated with acute head cold. Enough evidence of sinus trouble was found to account for the shadow on transillumination, but this would hardly explain the persistence of the symptoms of pressure of which the patient complained. Directions were left to have the sinus irrigated at intervals of three or four days until the secretions disappeared. At the same time the patient was referred to Dr. Moorehead to have the decayed upper molars removed. Arrangements were made for a Wassermann test. Nothing was found to indicate a malignant growth in the sinus.

It is now two months since I first saw this patient. He comes today complaining of increasing pain over the right side of the face. The Wassermann test has been found negative and the decayed upper molar teeth have been extracted. I am struck at once by the change in the patient's appearance. He has evidently lost in weight and shows distinct cachexia. He complains especially of the pain which still persists in the gums from which the teeth have been extracted. Examination shows the right eyeball somewhat protruding and fixed, and the patient is blind in this eye. No evidence of any trouble is found intranasally, but from the unhealed tooth-sockets exuberant newly formed tissue protrudes. Portions of this growth have been examined microscopically, and we now know it to be carcinoma.

Subsequent History.—The patient was referred to Dr. Bevan, who operated and removed the superior maxilla. The patient did not recover from the operation, but died about one week later.

CASE II. CHRONIC EMPYEMA OF THE NASAL ACCESSORY SINUSES

The case is that of a woman, aged thirty-nine, who consulted me last September. She complained of a purulent discharge from the left side of the nose which had annoyed her for something over two years. For the past six months she had suffered more or less from pains centering about the inner canthus of the left eye. During this period she had also suffered a great deal from headaches. She stated that during the previous winter the left maxillary sinus had been punctured and irrigated every few days for a couple of months, but without improvement.

The examination disclosed a profuse discharge of creamy pus oozing out from among a mass of small mucous polypi which filled the middle meatus of the nose on the left side. The right side of the nose appeared quite normal. Transillumination disclosed perfectly clear frontal and maxillary sinuses on the right side, while both of these sinuses on the left side appeared quite dark. The left maxillary sinus was irrigated by introducing a canula through the middle meatus and a quantity of foul-smelling pus was washed out. Twenty minutes after this irrigation creamy pus began again to ooze from the middle meatus. It was evident that this could not be coming from the maxillary sinus, and its presence indicated a combined empyema, which, from the shadow over the frontal sinus, indicated an involvement of this sinus. The presence of the mucous polypi cropping out of the middle meatus from the floor of the ethmoid labyrinth pointed, in addition, to an involvement of the anterior ethmoid cells. Since the space between the middle turbinated body and the septum was quite free from either polypi or pus it seemed doubtful that the sphenoid sinus or posterior cells were involved.

There was no evidence of trouble with the upper molar teeth on the affected side, and it seemed clear, therefore, that the infection in the sinuses had originated in the nasal chamber. Most cases of accessory sinus infection, either acute or chronic, have their origin from acute inflammation in the nasal chambers. It is rather the exceptional case where the infection starts from an abscess about the roots of the upper molar teeth. An infection which starts from an alveolar abscess involves, of course, primarily the maxillary sinus, but the process is not necessarily confined to this sinus. Quite frequently both the frontal sinus as well as those ethmoid cells which drain into the middle meatus are also involved. Occasionally, one sees a pan-sinuitis involving all the accessory cavities on one side; that is, the sphenoidal sinus and the posterior ethmoid cells as well as those sinuses which drain into the middle meatus, namely, the frontal and maxillary sinuses, together with the anterior ethmoid cells, all having its origin from the rupture of a tooth abscess into the maxillary sinus. I have seen the infection in such cases involving all the sinuses on both sides of the head. The passage of the infection to the opposite side may take place through a rupture of the septum dividing the two frontal sinuses.

The problem of how best to handle these chronic cases is not always an easy one. Where there is a dental origin for the trouble, the first thing to do is to see that the offending tooth is extracted. This alone is seldom sufficient to cure even a chronic empyema restricted to the maxillary sinus. To cure these cases it is necessary to secure, first of all, better drainage. In order to secure this there are several types of operation that may be undertaken. In the case of the maxillary sinus, the most radical procedure consists in the removal of the anterior wall of the sinus and the making of a large counter-opening from the sinus into the nose. This last procedure consists in the removal of the outer nasal wall lying under the inferior turbinated body. The opening under the lip which was made to permit the removal of the anterior sinus wall is now closed, and subsequent treatment is carried out through the nose.

In the case of the frontal sinus the radical operation consists in an external operation. The incision is made along the line of the eyebrow, and after the periosteum has been elevated the anterior wall of the sinus is removed and the nasofrontal duct is enlarged. Drainage is then passed through this opening into the nose and the external wound sutured. By extending the incision in a curved line downward around the inner canthus one can, after elevating the periosteum, enter the ethmoid labyrinth from without, and in this way accomplish not only an exenteration of the ethmoid cells but also of the sphenoid sinus (Fig. 302).

These external operations are not the methods of choice for most cases of chronic empyema of the nasal sinuses. They are, as a rule, to be resorted to only in those cases where intransal operations have failed either to cure the trouble or at least to relieve the patient of the most annoying symptom, that of pain. Such operations, by supplying ample drainage, usually remove the danger of a more serious intracranial complication.

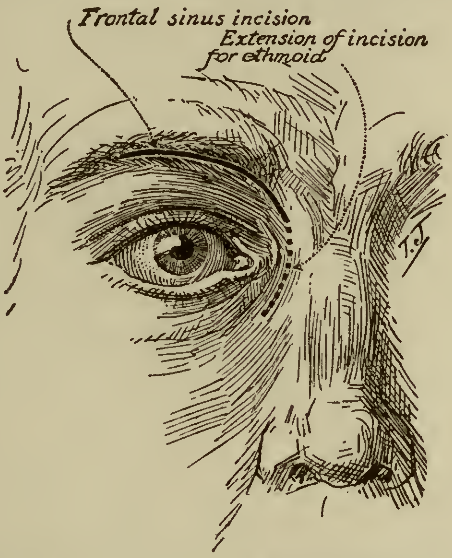

Fig. 302.—Drawing made to show line of incision through the eyebrow for making an external operation on the frontal sinus, also the extension of incision downward when the exenteration of the ethmoid cells is contemplated.

In the case which I am demonstrating the intranasal operation has been used. The first step was to remove the middle turbinated body. This was accomplished by making a horizontal incision through its anterior attachment. A wire snare was then passed over the anterior end and the entire turbinated body torn away (Fig. 303). At the same sitting most of the anterior ethmoid cells were removed by using a biting forceps. The operation was done under cocain, and the patient was required to stay over night at the hospital. The nose was not packed, as there was no bleeding. Two weeks later the patient returned to the hospital and an effort was made to secure ample drainage from the maxillary and frontal sinuses. The opening into the maxillary sinus was made by the removal of a large part of the nasal wall lying above the inferior turbinated body. The opening which was made was approximately ½ inch broad and at least ¾ inch long (Fig. 304). It required but a few seconds to make this opening, and the patient offered no objection to my going ahead with the operation of enlarging the normal opening of the frontal sinus. The intranasal operation on the frontal sinus is a much more difficult procedure than that of making a permanent opening into the maxillary sinus. The danger of penetrating the cribriform plate and of causing a meningitis must always be kept in mind. For obvious reasons, the intranasal operation on the frontal sinus should not be attempted until the operator has made himself quite familiar with the details of the

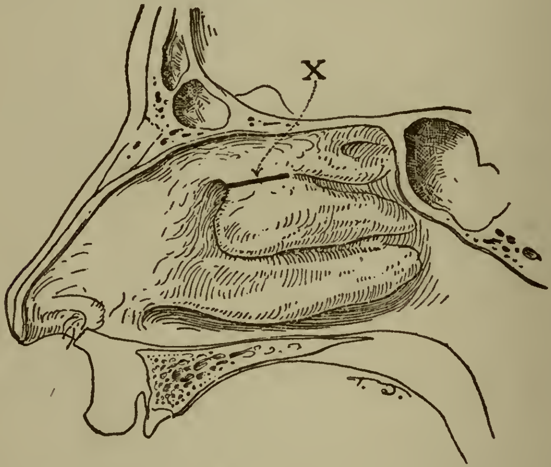

Fig. 303.—View of lateral wall of nose showing normal relation of turbinated bodies. Incision (*X*) through attachment of middle turbinated body preliminary to removal by snare.

anatomic relations about this region. In this case the first step in the operation on the frontal sinus was the removal of the last remnant of the anterior ethmoid cells which had remained after the first operation. This was accomplished by the use of a biting forceps so constructed as to cut from behind forward. By keeping the point of the forceps directed outward as well as upward the cribriform plate was avoided, since this dangerous area lies close to the septum. One can in this way use all the force necessary to break through the thin walls separating the ethmoid cells.

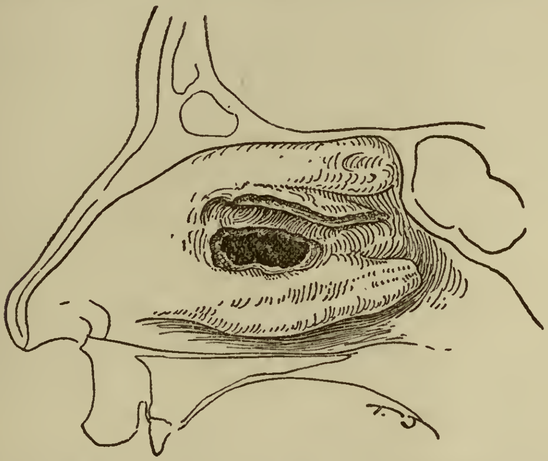

Fig. 304.—View of lateral wall of nose. Middle turbinated body removed showing opening made from middle meatus into maxillary sinus through what is known as the nasal fontanel—the least resistant part of the nasal wall of this sinus.

There is no danger of entering the brain cavity because the bony plate which forms the roof of the ethmoid labyrinth and separates these cells from the brain fossa is quite firm.

The operation for enlarging the nasofrontal passage was accomplished by means of a frontal sinus rasp, which was introduced through the normal opening and the passage enlarged anteriorly. The success of this procedure is not the same in all cases owing to the varying anatomic conditions which one encounters. In this case I did succeed in providing a fairly large opening. No packing was required, and the patient left the hospital the following day. The most important after-treatment in such cases is directed toward preventing the opening into the frontal sinus from contracting as the result of granulations developing on the site of the operation. In this case the granulations were kept down by the application of 10 per cent. solution of silver nitrate at intervals of about five days. The application is made on a small pledget of cotton attached to a probe which is so curved that it can be passed upward and forward into the frontal sinus.

It is now six weeks since the second operation, and the patient is already practically cured of her annoying symptoms. The pain disappeared immediately after the last operation, and the discharge has already subsided to such an extent as to cause practically no annoyance. Irrigation of the frontal and maxillary sinuses washed out very little secretion. The patient will be kept under observation, and the application of silver nitrate repeated at intervals of ten days to two weeks until the granulations cease to form in the nasofrontal passage. I fully expect that the patient will eventually make a complete recovery.

A word as regards the reasons for preferring the intranasal to the external method of operating. In the first place, the intranasal operation is done under local anesthesia, which, for obvious reasons, is much safer than an operation in this region under ether. The intranasal work in the hands of those who have acquired a thorough knowledge of the anatomy of this region carries with it no greater risk than does the external operation. In the case of the frontal sinus the external operation always leaves a permanent disfiguring scar, which even in the most favorable cases is always conspicuous.

As regards the end-results, most of the cases even of long-standing empyema can be cured by the intranasal method. Of those cases which are not completely cured there are very few where the intranasal operation has not relieved the patient of the most annoying symptom, namely, pain, and removed the risk of a possible more serious intracranial complication. The external operation, especially on the frontal sinus, should be reserved for those cases in which, after the intranasal operation, there still persist symptoms of obstruction to the outflow of pus, and especially where this obstruction is causing pain, or for cases where symptoms develop indicating a possible intracranial extension.

CASE III. SUPPURATIVE OTITIS MEDIA WITH PARALYSIS OF THE EXTERNAL RECTUS

The patient is a man sixty-eight years old who consulted me first in November, 1915. His one complaint was a profuse purulent discharge from the right ear, which had persisted since an acute purulent otitis media eight months before. The discharge from the ear was most profuse. The whole canal would become filled within a couple of hours after cleansing. The patient's general condition was good. He felt quite well. He had no discomfort in the region of the ear and there was no elevation of temperature.

The examination disclosed a perforation in the lower anterior part of the drum membrane. There was none of the narrowing of the inner part of the external canal which is so frequently found in cases where a mastoid abscess complicates an acute otitis media. There was no change over the outer surface of the mastoid and absolutely no tenderness on pressure. Transillumination showed a distinct shadow over the right mastoid which was not present over the left. A skiagraph showed a normal pneumatic mastoid process on the left, but a process completely free of pneumatic spaces on the right. The appearance of the right mastoid resembled very closely that found when the process is the seat of an extensive softening. Cultures from the pus disclosed pure culture of staphylococci.

The persistence of such a profuse discharge for over eight months, together with the distinct shadow over the mastoid on transillumination and the skiagraph findings, led us to believe that we were dealing with a mastoid abscess. It was decided, therefore, to open the mastoid and clean out the abscess cavity. The patient was given ether and the outer shell of the mastoid removed. To our surprise no abscess was discovered. The entire mastoid was free from pus, and throughout the entire process there was complete obliteration of pneumatic cells. Not having discovered in the mastoid the cause for the profuse discharge from the ear, it was decided to explore the region of the tympanum. Accordingly, the simple mastoid cavity was turned into a radical by the removal of the posterior wall of the external canal. After this was completed the walls of the tympanum were carefully searched for a passage which should lead to the abscess cavity, for it was quite evident from the amount of discharge in this case that it could not come from the tympanum alone. The only suspicious area found was at the floor of the tympanum, in a space which is known as the recessus hypotympanicus. This region was filled with granulations and distinct softening of the bone was detected. After cureting this region the posterior membranous wall of the external canal was slit so as to form two flaps. One flap was sutured above with catgut and the other below. The cavity was then carefully packed with iodoform gauze and the incision back of the ear closed with metal clips.

The patient made a quick recovery from the operation, with primary union of the incision back of the ear. The operation, however, did not cure him of his profuse discharge, which continued about the same as before the operation. The continuation of the discharge was found to come distinctly from the lower and anterior part of the tympanum, that is, from the recessus hypotympanicus and the orifice of the eustachian tube. I became convinced that we were dealing with an abscess in either a large tympanic cell or a large cell which occasionally exists in the region of the eustachian tube and drains through it. When these cells become infected it is not always possible to eradicate the seat of the trouble, as we are able to do when mastoid cells become the seat of a persistent infection, the reason being that operative work about the floor of the tympanum is restricted because of the proximity of the bulb of the jugular, and operations about the mouth of the eustachian tube have to be undertaken with great caution because the internal carotid lies in this region. For these reasons I decided not to attempt another operation. Conditions developed, however, which made a subsequent operation imperative. In spite of everything that we could do, a membrane gradually formed which closed off the anterior and lower part of the tympanic cavity. The patient did not live in the city and it was possible to see him only at irregular intervals. When I found it necessary to do a second operation I decided if possible to ferret out the abscess cavity from which the pus was pouring. The operation was undertaken.

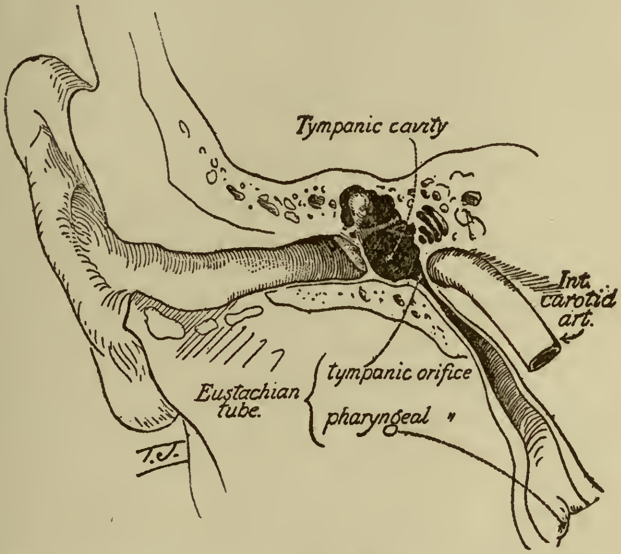

Fig. 305.—Semischematic drawing through the external auditory canal, cavum tympani, and eustachian tube intended to show the intimate relation which exists between the tympanic orifice and the eustachian tube and the internal carotid artery.

An incision was made along the line of the scar of the previous operation; the auricle was pulled forward so as to expose the tympanic cavity. The region of the floor of the tympanum was first thoroughly but cautiously explored and cureted by using curets with rounded tips. After this was completed I proceeded to explore, by the same cautious method, the tympanic orifice of the eustachian tube in order to discover any tubal cells that might exist in this region. The work in this region was done with the position of the internal carotid clearly in mind (Fig. 305). A strip of iodoform gauze was kept ready for a tampon should there be a chance injury of the internal carotid. A distinct softening of the bone was discovered in this region quite similar to that found during the first operation in the floor of the tympanum. I had all but convinced myself that all had been done which it was possible to do with safety when the operation was suddenly stopped by a flow of blood from the internal carotid. It was bright red and gushed up from the mouth of the eustachian tube. The strip of iodoform gauze which had been prepared for such an accident was quickly and firmly packed into the tympanic orifice of the tube and the bleeding completely stopped. The opening back of the ear was again closed and the entire cavity packed with iodoform gauze. I naturally felt that I had accomplished all that it was possible for one to do in this region.

On the second day after the operation the patient began to complain of seeing double, and it was found that he had developed a partial paralysis of the external rectus of the right eye. In another twenty-four hours there was a complete paralysis of this muscle. I felt that it was probable that the firm packing which I had placed in the tubal orifice might have something to do with this paralysis. The packing in the mastoid opening was then removed and the gauze cautiously withdrawn from the orifice of the eustachian tube. No bleeding took place. The iodoform packing was again inserted, but less firmly, and after a few days more this was left out altogether.

Paralysis of the external rectus is occasionally observed as a complication of mastoiditis. It appears to be the result of an extension of the inflammatory process to the apex of the petrous bone, where it succeeds in producing a circumscribed area of meningitis, sufficient at least to involve the sixth nerve, which lies in contact with the temporal bone in this region. The paralysis is, as a rule, temporary and gradually disappears. I have seen several such cases, and in all of them the paralysis has cleared up.

This patient complained a good deal of headache over the right temporal region, which continued for several weeks after the operation. He made, however, a quick recovery from the effects of the operation, but for months there persisted a profuse discharge coming from the region of the tympanic orifice of the eustachian tube. Early in October, 1916, he began to detect a diminution in the amount of the discharge and about ten days later it had ceased entirely. Since then there has been no return of the discharge. The entire mastoid cavity is quite dry and the mouth of the eustachian tube has been completely closed by a firm dry scar. Repeated examinations of the nasopharynx have failed to detect any evidence of pus escaping from the pharyngeal orifice of the eustachian tube, although the patient thinks he has more annoyance, especially at night, from secretion accumulating in the pharynx.

The paralysis of the external rectus began to disappear about three months after the operation, but did not clear up entirely until it had been present about eight months. The annoyance from double vision was relieved by using an opaque lens for the right eye. During all this time the patient's general condition has been good. At no time has there been any evidence of systemic poisoning from the infection in the ear.

CASE IV. CHRONIC INFECTION OF THE SUBMAXILLARY GLAND

The patient is a man fifty-seven years old who complains of a painful swelling under the angle of the jaw on the right side and another under the tongue in the floor of the mouth. The trouble developed last evening with a swelling of the right submaxillary gland. This morning he began to notice a soreness under the tongue. The submaxillary gland on the right side is found to be about the size of a pullet's egg and is slightly tender on pressure. The opening of the duct under the tongue is found blocked by a grayish-white lump which does not seem to be a concretion, but rather a thick clump of mucus (Fig. 306). This cannot be expressed until the opening has been slit. A bougie is then passed for a couple of inches into the duct, and its withdrawal is followed by the discharge of about 1 dram of milky fluid. Pressure on the swollen gland at the angle of the jaw forces out a little more of the same fluid. After this manipulation the patient experiences immediate relief from the feeling of tension and pain over the swollen gland and in the region under the tongue.

The patient has had similar trouble before. He states that that first attack was about two years ago. This developed in exactly the same manner as the present attack, with a swelling of the right submaxillary gland. The swelling gradually disappeared without treatment. The second attack came on just one year ago, when he consulted me about two weeks after the swelling of the gland had occurred. At that time he presented the same symptoms as in the present attack, with the same whit-

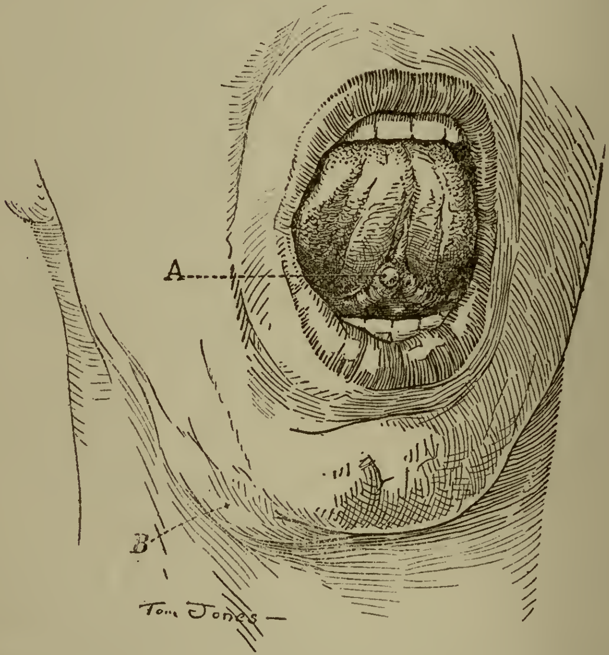

Fig. 306.—Sketch showing the dilated orifice of the opening under the tongue of the duct of the submaxillary gland in which is lodged a concretion (*A*). *B*, The swelling of the submaxillary gland caused by the infection with retention of secretions.

ish tenacious plug blocking the opening of the duct under the tongue. The passage of a bougie into the duct was followed by a discharge of milky fluid. This treatment was repeated as often as the patient experienced a return of the symptoms of retention over the gland. This was usually at intervals of ten days or two weeks. It was not until a couple of months later that this swelling of the gland entirely disappeared.

The patient is a victim of a form of chronic tonsillitis, and gives a history of recurring attacks of acute tonsillitis with an occasional attack of quinsy sore throat. The tonsils, as is usual in such cases, are quite hard from overdevelopment of connective tissue, and it is exceptional when pus cannot be expressed from the right tonsil. It seems possible that the infection of the submaxillary gland may have been brought about by the discharge of pus from the infected tonsils.

CASE V. CHRONIC EMPYEMA OF THE MAXILLARY SINUS

The case is that of a man who consulted me in March, 1911. He was then forty-four years of age, and complained of a bad-smelling, purulent discharge from the left side of the nose. This trouble had developed suddenly seven months previously, when he suffered from alveolar abscess around the second upper bicuspid on the left side. During the course of this trouble he developed pain over the region of the antrum and nasal symptoms, consisting of bad-smelling discharge and obstruction in the left side of the nose. The nasal symptoms persisted after the extraction of the diseased tooth. In this case the examination found the right side of the nose quite normal, but on the left side a creamy pus was found oozing out from under the middle turbinated body. The mucous membrane over the free edge of the middle turbinated body was congested and distinctly oedematous. Transillumination disclosed a marked shadow over the left antrum, the left pupil dark, and subjective light sensations on the right side only. The frontal sinuses on both sides were equally clear. On tipping the head forward pus reappeared in the middle meatus.

This examination disclosed an empyema of the left maxillary sinus, not combined with the frontal sinus infection, as in the previous case. The normal opening of the maxillary sinus *is at its upper border.* By tipping the head forward and to the opposite side secretion from the maxillary sinus, if such is present, will flow out of the normal opening. Under a local anesthesia the overlapping middle turbinal body was removed and a large opening made into the maxillary sinus above the lower turbinated body. The opening was $\frac{1}{2}$ inch broad and perhaps 1 inch long. In making the opening into the maxillary sinus in this region one must be careful not to operate too far forward, as there is danger of injuring the lacrimal duct, which may result in occlusion of the latter so that the tears will run out over the cheek. The opening can be made as far posteriorly as the posterior wall of the sinus. The sinus was thoroughly washed out but the once, and the patient not living in the city I did not get a chance to see him again until December, 1916, when he reported that the discharge from the nose had not returned after the operation and he had ceased having any of the symptoms for which he consulted me. Examining the nose, I found the nasal passages were clear, the opening into the maxillary sinus was still patulent. No secretion in the sinus was washed out by irrigation. Transillumination tests showed perfectly clear maxillary sinuses on both sides. In other words, the patient has had a complete cure of his chronic empyema of the maxillary sinuses by establishing a permanent large opening into the nose.

It has often been supposed that an opening into the inferior meatus is of greater value than one into the middle meatus of the nose, because the former opening lies nearer the floor of the maxillary sinus and supplies better drainage. As a matter of fact, however, I have found that a large opening into the middle meatus is much more easily made and gives just as satisfactory results as an opening below. Apparently it is the securing of free ventilation which is the important factor in these cases, and the ventilation from the middle meatus is just as satisfactory as though the opening were made below the lower turbinal.

CASE VI. LUDWIG'S ANGINA

This patient is a young man, twenty-one years old, whose complaint consists of a swelling involving the floor of the mouth and the glands of the neck, together with intense pain in this region and inability to close the mouth, from which there is a constant, profuse flow of mucus. There is also complaint of great pain and difficulty in swallowing.

His trouble developed about a week before admission to the hospital as a sore throat, with slowly developing swelling of the tissue in the floor of the mouth which was associated with the enlargement of the glands under the chin and at the angle of the jaw, especially on the right side. The infiltration in the floor of the mouth is hard, board-like, and rises quite to the level of the lower teeth. The elevation of the tongue brought about by this infiltration renders it impossible for him to close the mouth. The patient complains of a swelling of the tongue, and the elevated position of this organ suggests that it is also involved, but it is probable that the tongue is merely pushed upward by the swelling of the tissues underneath. The mucous membrane on the floor of the mouth as well as the sides of the tongue is covered by a dry whitish exudate. It is not possible to get even a glimpse of the faucial tonsils. There are two areas where infiltration is particularly hard. One is directly under the median line of the chin, the other is beneath the angle of the jaw on the right side. There is very little discoloration of the skin over the swollen region and no evidence of fluctuation. The temperature ranges between 101° F. and 103° F. There is a leukocytosis of 16,350. Cultures from the secretion in the mouth show almost a pure culture of streptococcus.

The treatment consists of hot moist dressings about the neck, an alkaline mouth-wash, and the administration of morphin to relieve the pain.

Subsequent History.—On the sixth day after admission to the hospital, and about two weeks after the onset of this trouble, the pain in the floor of the mouth rapidly became much more severe. In the course of an hour or two pus suddenly began to ooze from an opening somewhere under the tongue. In a very short time the patient had expectorated about 20 c.c. of yellow pus with a very offensive odor. Cultures from this pus showed streptococci in chains and pairs and a short thin bacillus. The relief following the discharge of pus from the mouth was immediate and very marked. The infiltration under the chin continued to increase in size and hardness. Four days later this was opened and about 2 drams of thick yellow pus allowed to escape. The recovery after the escape of pus from this point was very rapid.

CLINIC OF DR. CHARLES A. PARKER

THE HOME FOR DESTITUTE CRIPPLED CHILDREN

ACUTE SUPPURATIVE DESTRUCTION OF THE UPPER FEMORAL EPIPHYSIS—SO-CALLED EPIPHYSITIS

Summary: Report and demonstration of cases illustrating an acute inflammatory process in the upper end of the femur leading to the destruction of the epiphysis and disappearance of the head; three clinical types; prognosis—mortality fairly high in severe cases; flexion—adduction deformity usual following subsidence of acute symptoms; complete ankylosis rare; treatment—careful immobilization during acute stage with drainage in selected cases; deformity in late cases corrected under general anesthesia without open operation, if possible; subtrochanteric osteotomy indicated if satisfactory correction cannot otherwise be obtained; arthroplasties usually contraindicated.

THIS patient, P. N., is a child two years old, who was brought to the hospital February 14, 1917, with the following history:

In August, 1916, he was taken to the Cook County Hospital on account of an attack of acute poliomyelitis. While in the hospital it was noticed that the right hip was stiff and painful, but no special treatment was given, as the poliomyelitis was considered the prominent factor. On admission to this hospital the child was able to stand, but not to walk. The right hip was flexed, and the extensor muscles of the thigh were completely paralyzed as the result of his attack of infantile paralysis. A skiagraph of the hip showed a complete loss of the femoral head and partial destruction of the neck (Fig. 307). As his suffering was not acute and his general condition good, a plaster cast was applied to the hip and body for immobilization and relief of deformity. The symptoms became acute, and today we open the fluctuating area about the great trochanter (makes incision through skin and into abscess) and evacuate several ounces of pus. A drainage-tube is inserted and the wound dressed. No effort is made to find the sequestrum, as the child is quite ill, and the immediate indications are met by the drainage. There is no evidence from the x-ray that a sequestrum is present.

I show you skiagraphs of 4 other cases that have recently been under my care (Figs. 308 to 315). Their brief histories are as follows:

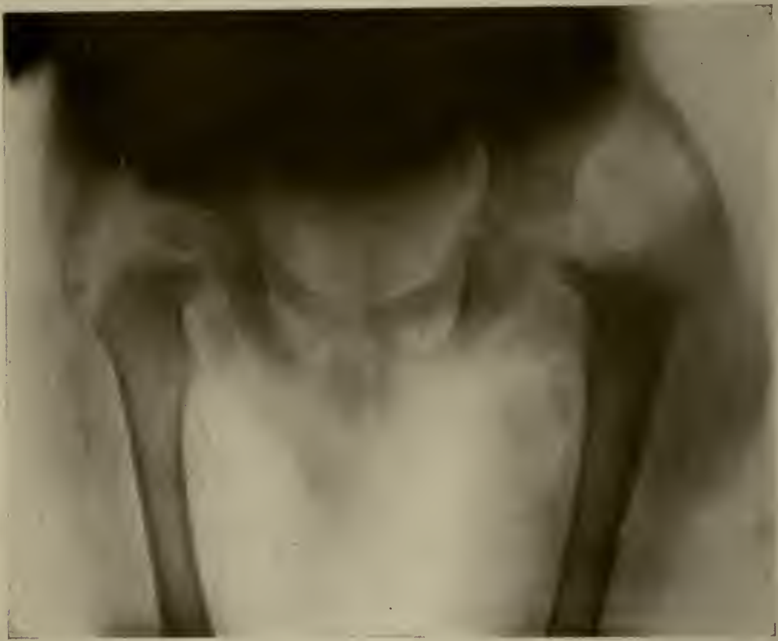

Fig. 307.—Case I: P. N., aged nineteen months. Note absence of the upper epiphysis and part of the neck of the femur with upward displacement of the shaft.

Case 2.—E. B., male, aged two years, entered the Home for Destitute Crippled Children February 16, 1915.

When a year old he had pneumonia, whooping-cough, and "meningitis." He was able to walk before his illness, but has not been able to do so since. Both hip-joints were flexed about 45 degrees and motion was limited, but without pain.

A skiagraph discloses the absence of the upper epiphyses of both femora (Fig. 308). Their destruction probably occurred during the patient's severe illness. No sinuses or scars are present and there is no history of a discharging abscess. An attempt was made, under anesthesia, to correct the position of the legs, but was unsuccessful. A subtrochanteric osteotomy was then done on both femora and a cast applied, with the legs in an extended position.

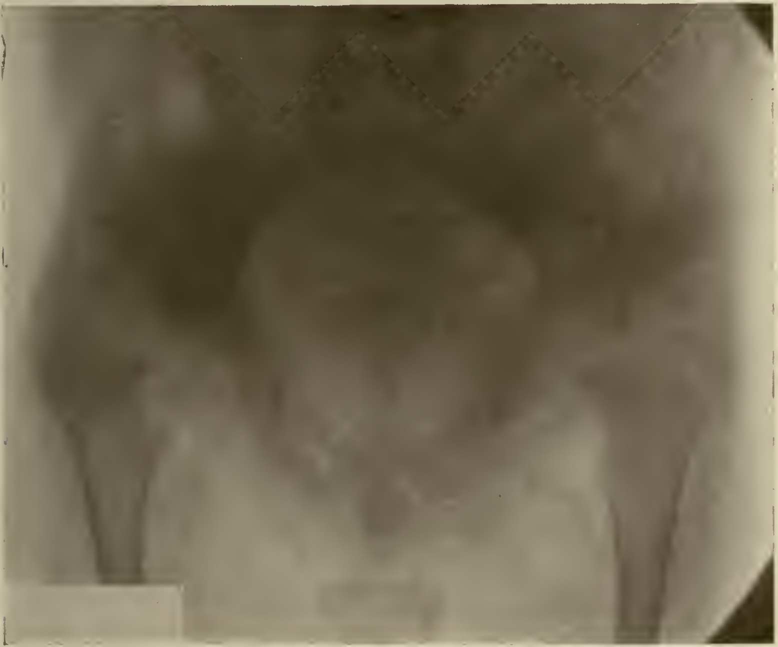

Fig. 308.—Case II: E. B., aged two years. Absence of the upper epiphyses of both femora with displacement of the shafts. No evidence of spontaneous or operative drainage. Considerable flexion deformity not shown in skiagraph.

The cast has recently been removed and the position is good. There is still some movement in the hips and his position is upright. (See skiagraph of present condition in Fig. 309.)

Case 3.—J. L., female, aged eighteen years, entered Cook County Hospital July 18, 1916.

The patient says that when she began to walk her parents noticed that her right hip was deformed. It has always been flexed. There has never been any special pain, the patient has never been incapacitated for work, and there are no scars or sinuses nor history of a discharging abscess.

The right thigh is flexed about 75 degrees and adducted about 30 degrees. There is an apparent shortening of 4½ inches, with a real shortening of 1½ inches. There is considerable motion in the joint. Figure 310 is a skiagraph showing the absence of the femoral head, with the short neck burrowed into a false socket developed on the surface of the ilium.

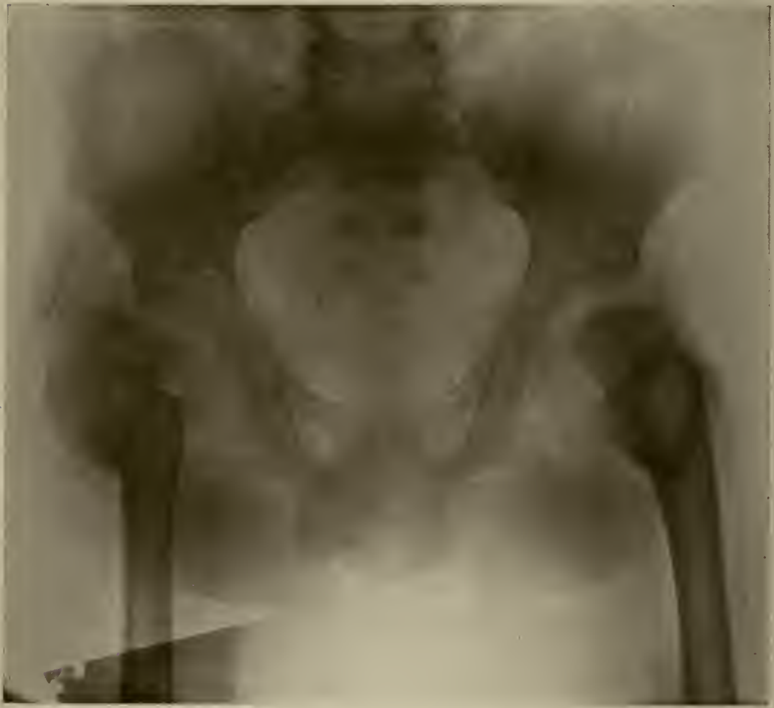

Fig. 309.—Case II, E. B.: After bilateral subtrochanteric osteotomy for correction of flexion deformity.

On July 24, 1916, a subtrochanteric osteotomy was performed, the leg extended to normal, and somewhat abducted. Figure 311 is a skiagraph of the corrected femur in the cast. The angle of correction is quite marked. The cast was removed about two and one-half months later, and the patient now stands erect and walks with only a slight limp. The leg is now apparently full length, although it is still actually 1½ inches short (Fig. 312).

Case 4.—S. D., male, aged two years, entered the Home for Destitute Crippled Children December 17, 1915.

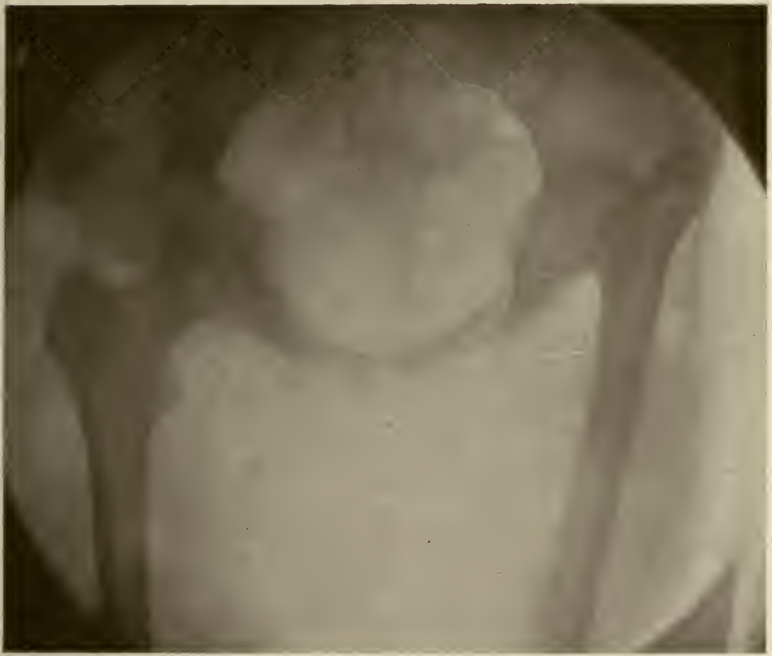

Fig. 310.—Case III: J. L., aged eighteen years. Showing remnant of neck of right femur anchored in a secondary socket on the ilium. The adduction deformity is quite marked.

Ten months before admission to the hospital the child had fallen from a chair, after which he was unable to walk, although he had walked previously. The patient lay with the right thigh flexed on the abdomen and crossed over to the left side. A skiagraph showed complete absence of both head and neck of the femur, with backward and upward displacement of the shaft. There were no sinuses or scars and no history of a discharging sinus (Fig. 313).

Under general anesthesia the leg was brought down nearly to the normal position and put in a plaster cast. This was changed at intervals until the position of the leg was considered satisfactory.

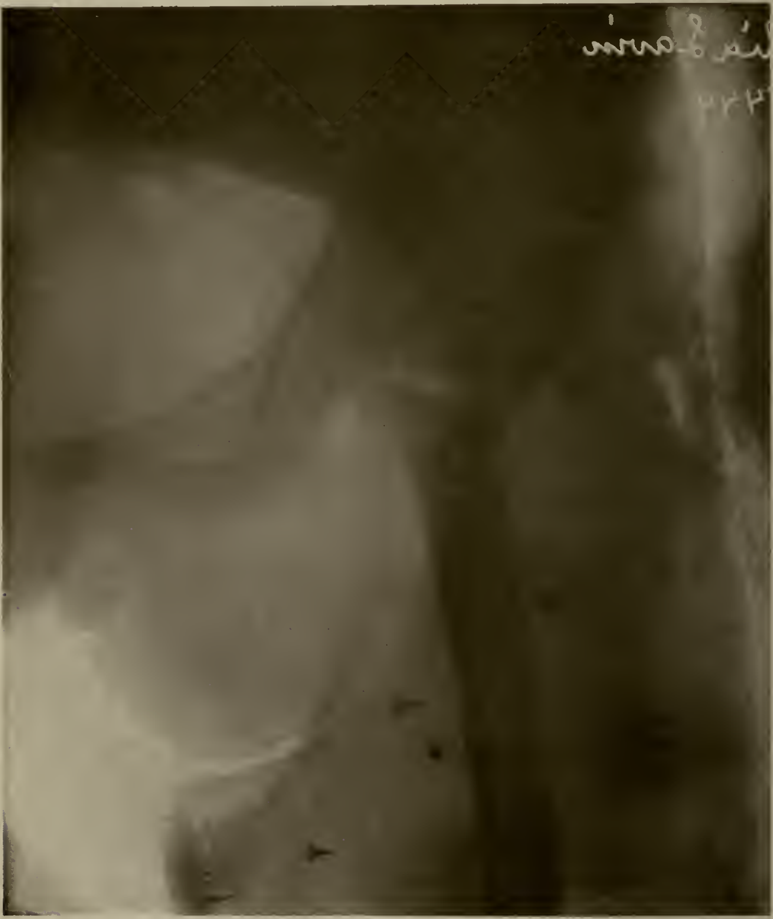

Fig. 311.—Case III, J. L.: Showing the right hip in a cast after operation. The line of section is distinct and the abducted position of the limb is well shown.

This patient recently died from a cerebral lesion, probably of an infectious nature.

Case 5.—L. T., male, aged four years, entered the Home for Destitute Crippled Children January 17, 1917.

When eight months old the patient fell out of bed, striking on the right side of body. The mother says that the hip did not become swollen and that the child had no fever. He did not walk until he was twenty-five months old. Then he walked with a limp. He was given medicine for rheumatism. On examination, the right hip was found to be flexed and abducted. There were no scars nor sinuses and no history of abscess. A skiagraph showed a shortened and deformed neck, with the presence of a defective epiphysis in the acetabulum. Perhaps this was a fracture, but the history and symptoms are so similar to the other cases that it is included as a doubtful case, in which

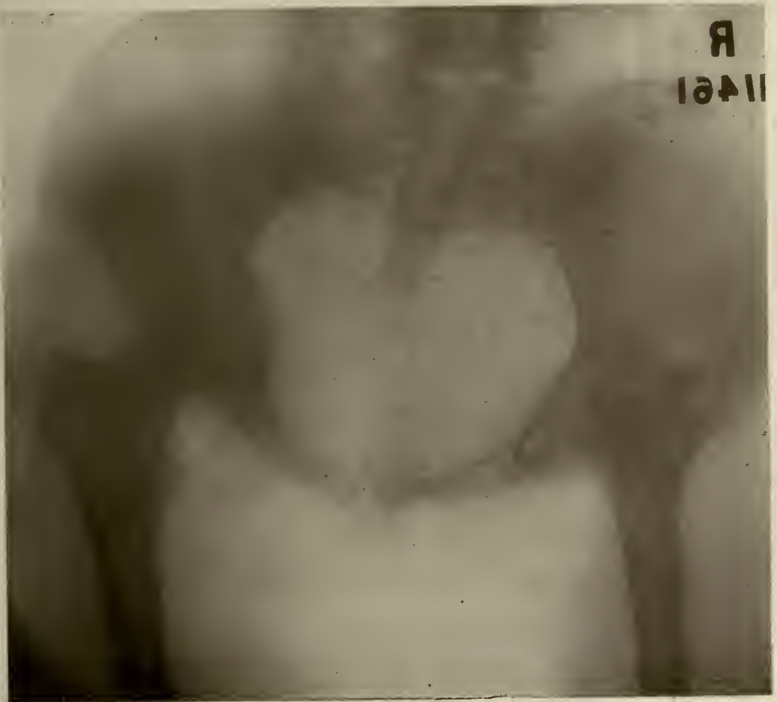

Fig. 312.—Case III, J. L.: A recent skiagraph showing both hips in their new relation and the line of section becoming indistinct.

possibly there was an infectious process which did not succeed in entirely destroying the epiphysis, although it did seriously damage the neck. The child is now wearing a cast on account of tenderness in the joint (Figs. 314 and 315).

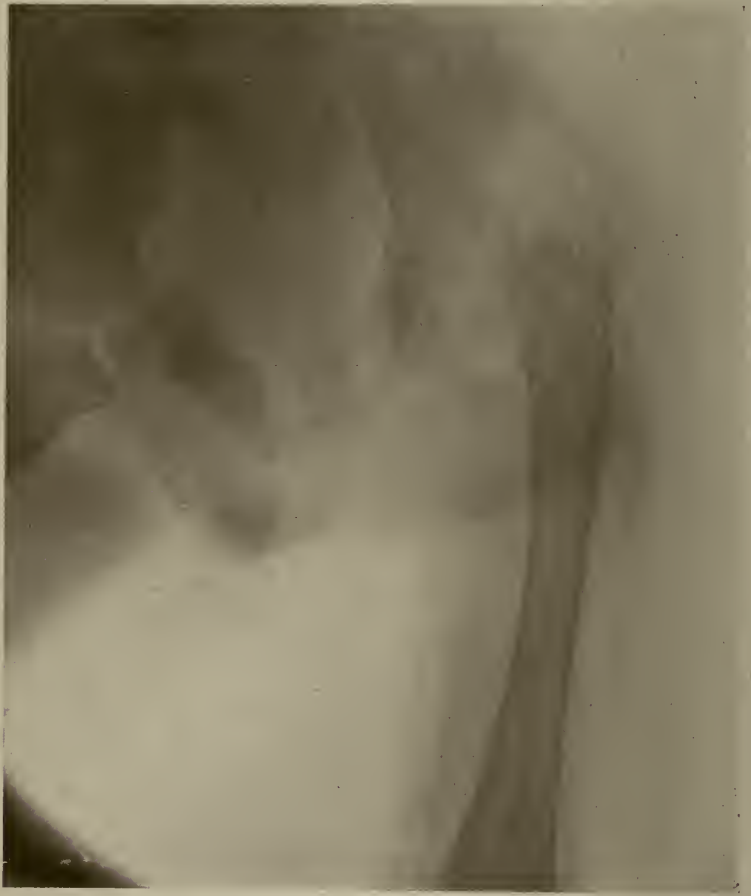

Fig. 313.—Case IV: S. D., aged two years. Entire absence of upper epiphysis of right femur with displacement of shaft. No evidence of spontaneous or operative drainage.

The occurrence in children of an acute inflammatory process in the upper end of the femur, leading to the destruction of the epiphysis and disappearance of the head, is not rare in the ex-

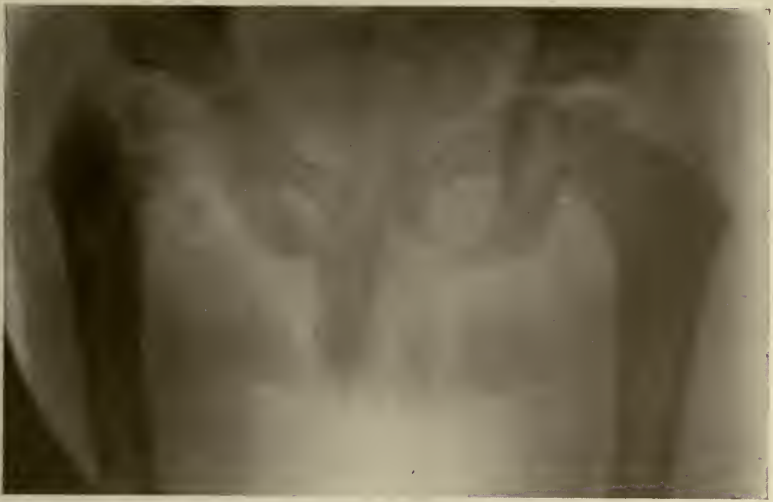

Fig. 314.—Case V: L. T., aged four years. Showing upper end of right femur with the epiphysis complete and in the acetabulum and the shortened defective neck. The original skiagraph was taken with a reversed plate, so the print is deceptive in apparently reversing the joint affected.

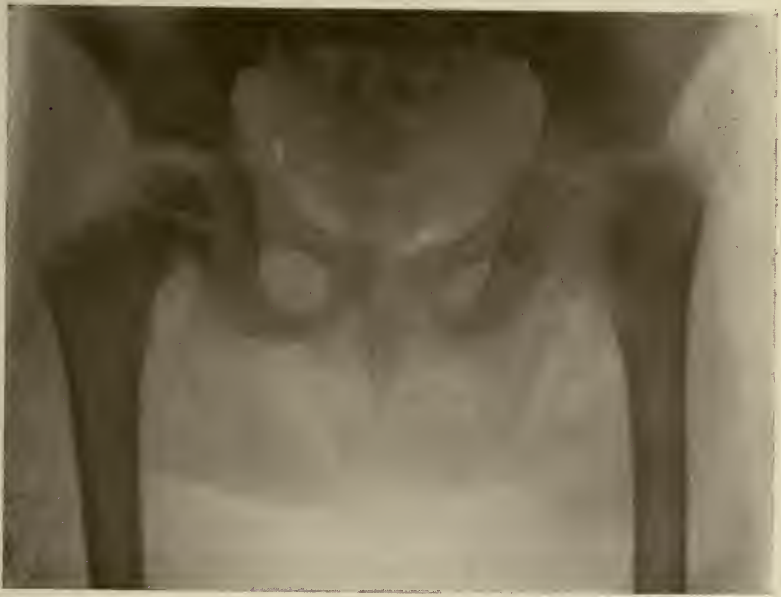

Fig. 315.—Case V, L. T.: Showing the defective neck of the right femur with the pathology less distinct than in Figure 314.

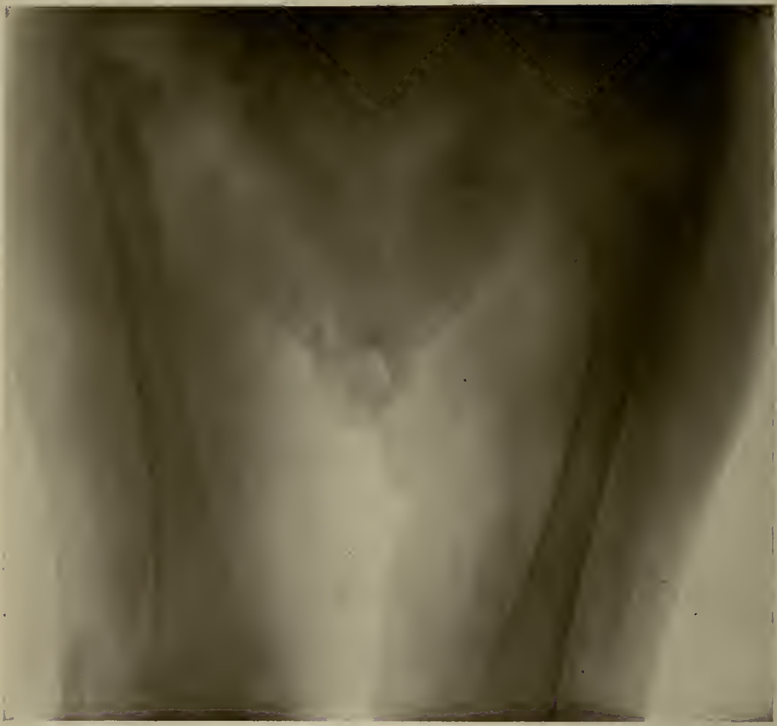

Fig. 316.—E. S., aged two and one-half years. Destructive changes in both hips. In the left hip the epiphysis is intact and in the acetabulum. In the right hip it is apparently absent, although the rather long fragment of the neck is in the acetabulum. The left hip resembles closely the right hip of Case V (Figs. 314, 315).

perience of surgeons handling many joint cases. The ensuing deformity likewise not infrequently comes for relief.

PATHOLOGY AND CLINICAL TYPES

The pathologic process is probably always primarily an osteomyelitis of the upper portion of the shaft of the same general nature as similar processes elsewhere, but the early death of the epiphysis within the joint, due to its lack of sufficient vascular ligamentous attachments after destruction of the supporting neck, makes the resulting catastrophe unique and one meriting special consideration.

It is usually a secondary infection, as is osteomyelitis in general, and the organism most commonly found is a staphylococcus.

Mild infections accompanied by fever, tenderness, and disturbance of function, but not proceeding to epiphyseal destruction or permanent joint changes, not infrequently occur in this region. Rest of the part results in a gradual subsidence of symptoms and complete restitution of function.

Next in severity is the type in which destruction of the epiphysis and displacement of the upper end of the femur takes place, but in which the process subsides without a discharging abscess. Usually these patients are seen long after the acute process has subsided, and the diagnosis must be made from the history of previous acute trouble in the hip, from the absence of local scars, and from the *x*-ray findings. This was the condition in three of our cases. In one of these a diagnosis of congenital dislocation of the hips had been made previous to obtaining good skiagraphs of the joints. The process is frequently an insidious one, the symptoms being disguised by more patent and severe processes going on elsewhere at the same time.

Thirdly, there is the extreme type with severe local and general symptoms followed by a discharging abscess, opened either spontaneously or by the surgeon, and showing the same destruction of the head and displacement of the shaft as in the intermediate group, but with the addition of the sinuses, or scars of their former presence.

SYMPTOMS AND DIAGNOSIS

The condition is necessarily limited to the years of epiphyseal growth, and the largest number of cases have occurred between the ages of seven and seventeen years, with a preponderance in males of 3 to 1 during the first three years of life, after which it is about equally divided between the sexes. In my experience it has been practically limited to infancy or early childhood.

The diagnosis depends to a considerable extent upon the force with which the attention is directed to the hip-joint.

In one of the cases here reported (Case 2) a history of "meningitis" at one year of age, with no knowledge of hip trouble, was elicited from the mother after much questioning. In this case both hips were affected, and recovery had followed without a discharging abscess. This was later mistaken for a case of double congenital dislocation of the hips.

In another instance (Case 1), the one before you today, the child was in the County Hospital with a diagnosis of infantile paralysis when the hip condition was first noticed. There was total paralysis of the extensor muscles of the thigh and limited motion of the hip-joint of the same side. The hip was painful, but the symptoms were not acute. Today—that is, several months later—the child is brought to the clinic with an acute exacerbation of the hip trouble and a large abscess around the upper end of the femur. An *x*-ray shows loss of the epiphysis. The abscess we have just drained, but the paralysis remains.

In Case 3 the young lady states that her parents told her that when she commenced to walk they noticed that her right hip was deformed and that she has always walked lame. No sinuses have ever been present.

In Case 4 the child fell from a chair when a little over a year old and has not walked since, eight months after the injury. Here there is marked deformity of the hip, but no evidence of a discharging abscess or present infectious process. The *x*-ray shows destruction of the head and neck and involvement of the shaft.

In Case 5 there is also a history of injury with attention directed to the hip. The child fell out of bed when eight months old and did not walk until he was twenty-five months old. In the meantime he was treated for rheumatism. It is stated that the hip was not swollen. There is no evidence of a discharging abscess. The *x*-ray shows a distinct deformity of the neck, with shortening and the presence of the defective epiphysis in the acetabulum. This picture is different from the others and may cast doubt on the diagnosis, but the history is so similar to the rest, and the *x*-ray so suggestive of inflammatory action, that the case is tentatively included in the group as a possible form in which the epiphysis escaped its usual fate. Trauma is thus strongly suggested as a localizing factor in the infection.

The process is always fairly acute, although the symptoms may be greatly obscured by diverting conditions elsewhere or the comparative mildness of the local reaction. However, an acute inflammatory disturbance of the hip following a trauma in a child should put us on our guard as to the probability of the process being destructive in character. Extreme general toxicity is present in the severer cases, while pain and swelling with high fever are present early and evidence of pus soon appears.

The *x*-ray may at first show no definite change in the structures except possibly a beginning separation of the joint surfaces from accumulating fluid. Later the picture is quite characteristic, with the altered or absent epiphysis and the displaced and deformed neck and shaft of the femur. The acuteness of the whole affair distinctly differentiates it from a tuberculous process. The active disease usually completely subsides in a much shorter time than it takes a tuberculous process to heal, although discharging sinuses may remain.

PROGNOSIS

It is difficult to determine the mortality of a condition as frequently unrecognized in the acute stage as is this one. Most of the cases first come to the doctor to be treated for the deformity, sometimes without any recollection of a preceding acute process.

In only 1 of 3 acute cases which I have observed and upon which I have operated do I know that the death resulted from this condition. One left the hospital a few days after the operation and its fate is not known. The third is the one operated upon today. Of the 5 cases here reported, 4 had passed through the acute period before coming to my service. Statistics, however, show the mortality rate to be high, which is quite natural for so severe an affection in young children.

RESULTS

The function of the hip-joint is usually greatly impaired. The stump of the neck or the shaft is often displaced on to the dorsum of the ilium, where it may secure an efficient lodgment in the reparative development on this surface, as is well shown in Case 3, Fig. 310.

I have never observed complete ankylosis, although the movements of the joint have generally been considerably limited. The hip is usually flexed and adducted, often to a position of extreme deformity. Walking is usually possible, although often greatly interfered with. A lighting up of the old process occasionally occurs.

TREATMENT OF THE ACUTE STAGE

During the acute stage the treatment is that of osteomyelitis in general with the complication of joint infection. In the extreme cases with severe general and local symptoms immediate opening of the bone and the joint are necessary to save life, though loss of the epiphysis and impairment of the joint are practically sure to occur.

If the focus in the bone can be reached early enough the joint may not have to be opened and the epiphysis may possibly be preserved, but the opportunity for this, unfortunately, is rare. When the joint is opened the epiphysis is usually removed to enhance healing.

There are many mild cases in which the whole process subsides after a period of rest and the joint completely recovers its function without operation.

Between these two classes of cases is the insidious type, with a minimum of local and general symptoms, yet followed by destruction of the epiphysis and joint injury. This class is frequently seen after the acute symptoms have disappeared and the resulting deformity has occurred. It subsides with or without the occurrence of a discharging abscess.

It is generally inadvisable to open the joint in these cases, as the results from spontaneous healing are usually quite as good as those following operations upon the joint, and in those healing without discharge the results are much better. Opening down to the neck or shaft of the femur in the early stages in an effort to abort the process is a rational procedure. Removal of the epiphysis itself in young children is seldom called for, as the destructive process usually so completely destroys it that it cannot be found by the x-ray and no doubt is soon entirely disintegrated. In all cases careful immobilization of the joint in the proper position by suitable apparatus during the time of treatment is indicated.

TREATMENT OF THE DEFORMITY

The orthopedic surgeon is more frequently consulted for the resulting deformity than for the acute disease. The thigh is usually held more or less fixed in a position of flexion and adduction. This may be so severe as to cross one leg over the other with the thigh approximated to the abdomen.

When there is no further evidence of the presence of the original infection, the thigh should be brought down to its normal position of extension under general anesthesia, and slightly abducted and held in a plaster cast until it shows a disposition to retain this position when the cast is removed. Frequently this cannot be accomplished without a subtrochanteric osteotomy, which should always be done when the position cannot be obtained and maintained otherwise. This is done with an osteotome, through a small longitudinal incision not over 1 inch long, just at the lower margin of the great trochanter. The osteotome is entered in the line of the incision and pressed down to the bone, when the edge is turned across the axis of the femur and driven through the bone until the latter is easily broken. The limb is then brought into the desired position of extension and abduction and held with a plaster-of-Paris cast until healing is secure.

Figures 308 to 312 show the bone before and after osteotomy. Standing and walking are very much improved by this treatment. In Case 3 the practical shortening before operation was 4½ inches, while after the operation it was *nil*, the position of abduction entirely compensating for the 1½ inches of real shortening present. Operative procedures to replace the neck of the femur in the acetabulum or to reconstruct the joint are usually unsuccessful, as in addition to the difficult mechanical problems to overcome these joints are very prone to reinfection after operation.

Note.—Since this clinic was given there has recently come on my service in the Cook County Hospital another case of this condition showing a combination of results in the same patient that is very instructive. The child, E. S., is two and one-half years old and cannot walk. It was noticed by the parents that when the child began to walk at fourteen months it dragged the left leg. About four months ago it became unable to walk, and lay with both thighs flexed on the abdomen, in which condition it was brought to the hospital.

The child was fairly well nourished and did not appear to be acutely sick. With a little petting the left leg could be straightened out entirely and movements appeared to be normal. The right hip, however, was painful and resisted manipulation. A skiagraph showed the remarkable condition seen in Fig. 316; the upper part of the shaft and the neck of the femur are distinctly affected by the inflammatory process, now quiescent, while the head of the right femur is absent and the neck lies in the acetabulum. No sinuses nor evidence of abscesses were present.

This strengthens my opinion that Case 5 (Figs. 314 and 315) was due to a similar process and not to a fracture, and is a modified and favorable result of these inflammatory conditions.

CLINIC OF DR. PAUL OLIVER

Cook County Hospital

EPITHELIOMA OF THE CHEEK

Summary: A patient presenting a lesion of two years' duration which has steadily increased in size in spite of a variety of local "treatments"; gumma and hypertrophic tuberculosis ruled out by the history and the character of the lesion; local adenopathy due to secondary infection; treatment.

This man, a carpenter, entered the hospital January 15, 1917, because of a growth on the left cheek. He stated that this began two years ago as a small papule in the skin and that it grew slowly. What he describes as small seeds would appear on the surface, dry up, and drop off. In one year's time it had grown to the size of a large pea, when it was cauterized with acid by a physician. This reduced it to an ulcerated surface covered by a crust. The mass recurred, and the patient has repeatedly applied glacial acetic acid during the past year. In spite of this there has been gradual extension with more rapid growth lately. He has been applying a salve which has destroyed the growth and left a crater-like, raw surface. There has never been pain until three months ago, when it became suddenly swollen and painful due to infection. He has worked until a few weeks ago, feels strong, and eats well. He thinks he has lost only a little in weight. Previous history is negative. Denies luetic infection.

On examination, we note that the center of the left cheek is the seat of a crater-like ulcer, fairly circular in outline and about 5 cm. in diameter (Fig. 317). The entire side of the face is swollen and dusky red, the eyelids edematous, and the left eye nearly closed. The margin of the ulcer is irregular, thick, raised, and everted. The floor in the center is depressed to a depth of about 3 cm. It is covered by a dirty yellow, foul-smelling exudate. The mucosa of the cheek is infiltrated but not perforated. The wall of the crater is firm—not hard. The lesion involves all the tissues of the cheek and is fixed to the superior maxilla. Posterior to the ulcer are noted several pin-head suppurating spots. The lymph-glands of the submaxillary triangle are about the size of beans and fairly soft.

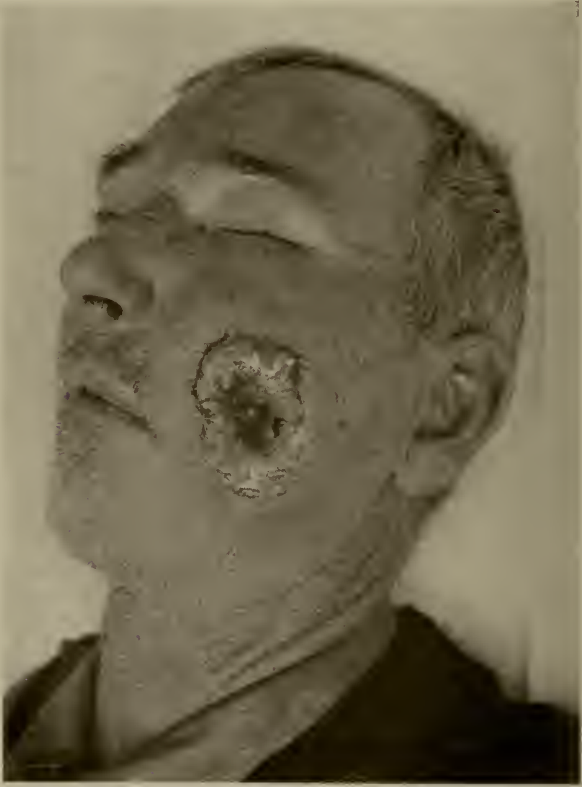

Fig. 317.—Ulcerating epithelioma of cheek with marked secondary infection. Note evidences of inflammatory edema of surrounding tissues with especial involvement of the eyelids.

The patient states that a diagnosis of lues had been made—presumably gumma. The duration of the process is too long for a gumma and the firm raised margins of the lesions are not like those of a gumma. Hypertrophic tuberculosis might be considered. If such were the case, however, we would expect some scar tissue as evidence of healing in the older parts. The ulcer is not superficial and does not have the soft undermined margins which we might expect in tuberculosis. The history of the lesion and findings fit in best with epithelioma. It is probably an epithelioma of the basal-cell variety. The nature of the primary growth and the absence of hard, round regional lymph-nodes would speak for this. The secondary infection probably accounts for the lymph-nodes' involvement, the nodes being rather soft and ovoid. The rate of growth, which seems rapid for a rodent ulcer, might be accounted for by the repeated irritation of the caustics applied by the patient.

The seed-like particles of which the patient speaks make us think of epithelial pearls, which are uncommon in basal-cell epithelioma. A positive diagnosis can be made by microscopic section. There can be little doubt, however, that we have to deal with an epithelioma complicated by a secondary pus infection.

I have advised this patient first to have the infection cleaned up, and then to submit to operation, this to be followed by roentgen-ray treatment. In the operation it was my intention to ligate the external carotid artery, and then to excise the growth widely with the cautery. The patient has refused operation, electing to try the roentgen ray first.

ACUTE RETENTION OF URINE DUE TO URETHRAL CALCULUS

Summary: A patient with inability to urinate and coincident dribbling of urine of two days' duration associated with a markedly distended bladder, pains in the penis, a palpable mass in the urethra, and a history of renal colic; removal of calculus under local anesthesia; distensibility of ureter; wisdom of conservative management of ureteral calculi.

January 31, 1917.

THIS man, thirty-two years of age, a teamster, states that he was perfectly well until five days ago. At that time, while at work, he was suddenly seized with a severe pain in the left lumbar and iliac regions. The pain was sharp, cutting and constant, and did not radiate. This continued uninterrupted for three days until he took spirits of niter and a large dose of patent medicine. He then urinated very freely and the pain in the lumbar region ceased suddenly. A few minutes later the urinary stream stopped abruptly and completely. From that time until coming to the hospital, an interval of two days, he had moderate, intermittent pain in the penis. There has been constant desire to urinate, but inability to do so. There has been some discomfort in the lower abdomen and a constant dribbling by urethra. There were no urinary symptoms or changes in the urine noted by the patient during the severe pain in the lumbar region.

The patient states that he had a similar attack fifteen years ago, when a small stone was removed from the urethra. Since then he has been perfectly well. He has been a heavy drinker and smoker.

Examination, when he entered the hospital, showed a healthy young adult of massive build. In the penile urethra, about 6 cm. from the meatus, could be felt a hard mass. There was tenderness over the lower abdomen and the distended bladder could be made out nearly as high as the umbilicus. This stone (Fig. 318) was removed, under cocain, through the urethra by means of alligator forceps. It was a mulberry stone, and measures 15 x 11 x 8 mm. Roentgen-ray plates of both kidneys and ureters show no shadows indicating other stones.

This stone probably was formed in the pelvis of the kidney, and its passage along the ureter with blocking of the ureter gave rise to the acute colic. The pain in the lumbar region was due probably to the distention of the kidney pelvis, while the pain in the iliac region was due to the direct irritation of the stone lodged in the lower ureter. This case simply illustrates that a stone of fair size will pass through the ureter, and that it is well to delay operation until a reasonable time has been allowed for this to occur. For the ureter to allow such a stone to travel its entire length in three days indicates that it is capable of rapid distention much beyond its normal caliber.

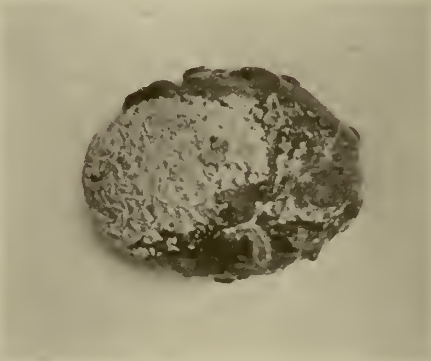

Fig. 318.—Calculus after removal from urethra. Dimensions, 15 x 11 x 8 mm.

This case is also an example of one of the less common causes of acute retention of urine in adults.

CARCINOMA OF THE STOMACH

Summary: Obstruction at cardiac end of esophagus due to advanced carcinoma; symptoms and physical signs; the diagnosis; gastrostomy.

This patient is a laborer, forty-eight years of age, who was admitted to the hospital September 18, 1916, complaining of pain in the abdomen, difficulty in swallowing, great loss of weight, and constipation. He had never been sick until six months ago except for colds and occasional headaches. At one time in Poland he had chills and fever. He has been in the United States one year, speaks no English, and the history was obtained with difficulty even through an interpreter.

The history obtained states that six months ago he began to have trouble while working on shipboard. His appetite was fair and food did not distress him severely. He had continual abdominal pain, which began insidiously and gradually grew worse. He says his food seemed to stick. He was able to swallow, but there seemed to be some obstruction to the passage of food. There was no pain on swallowing nor any increased pain after eating. He weighed 165 pounds six months ago. His present weight is 104 pounds. He has a slight cough and raises some mucus. The bowels are constipated and have not moved in four days. He drinks moderately and smokes to excess. Venereal infection is denied. When he came to the hospital he was able to take liquid food. There is no history of vomiting or distress after eating. While under observation it was noted that practically all food taken was regurgitated a few moments after swallowing. He ate the meal slowly, and then shortly began to regurgitate.

This would indicate a lesion low in the esophagus.

You note that he is a very much emaciated man. He shows not only this emaciation but also marked brownish pigmentation of the skin. The skin is flabby and dry, with absence of the subcutaneous fat. He also appears somewhat cyanotic. The pulse is quite weak, rather rapid, and of low volume. There is marked prominence of the bones, clavicles, ensiform, and pelvis. The lymph-glands stand out because of the loss of subcutaneous adipose tissue. His trouble seems to center in the abdomen. We note a scaphoid abdomen, some pigmentation, and evidence of a rupture. There is noted in the median line just above the umbilicus a nodule about the size of a split pea. I find other nodules just beneath the skin. The one in the median line seems to be in the skin. The smaller ones are about the size of No. 8 shot and are hard. There seems to be some fulness in the left hypochondrium when compared with the right. In the right hypochondrium the liver edge can be palpated two fingerbreadths below the costal margin. It is hard and rather irregular. A hard tumor-mass can be felt descending from under the left costal margin on deep inspiration. It is hard and nodular and about the size of a fist. It extends beneath the ribs beyond the palpating fingers. There is no rigidity of the abdominal muscles, and because of the emaciation the mass can be definitely palpated and is freely movable with respiration. Tension of the abdominal muscles obliterates the mass. No tenderness is present and there is no free fluid in the abdomen. To percussion a tympanitic note is elicited in the left hypochondrium. Such a tumor mass might be connected with the spleen, left kidney, or stomach. This case might be a portal cirrhosis with enlarged spleen. The area of splenic dulness is not increased, however. The mass does not give the hard sharp margin of an enlarged spleen, but is nodular and rounded. The history also speaks against such a condition.

If this were a kidney tumor it would most likely be a hypernephroma, which is the most common kidney new-growth occurring in adults. We should expect to find the growth principally in the lumbar region palpable posteriorly and with enlargement downward in the flank. We would also expect urinary symptoms and signs.

Carcinoma of the splenic flexure of the colon would be more fixed and probably give more definite symptoms of obstruction.

All symptoms and signs point to an involvement of the stomach and esophagus.

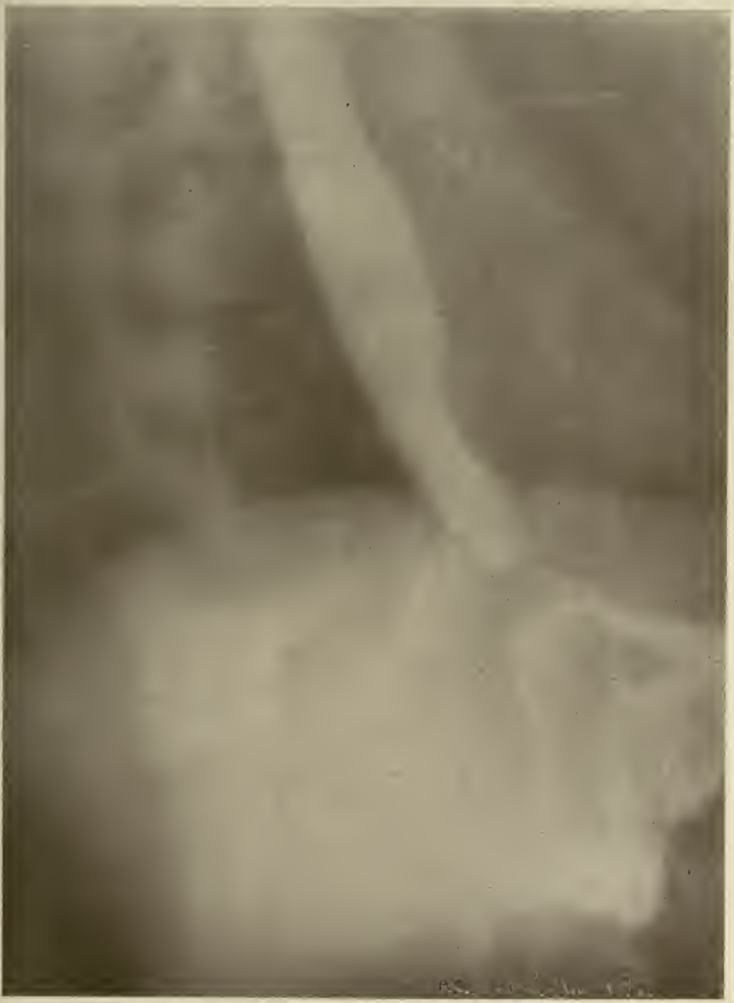

Fig. 319.—Roentgenogram after barium meal, showing marked obstruction at lower end of esophagus due to anatomic narrowing.

On further examination, small hard nodules can be felt between the ensiform and umbilicus inside the abdomen. There is no palpable gland in the supraclavicular fossa.

An Ewald test-breakfast was given and was regurgitated. Thirty minutes later a stomach-tube was passed and 2 ounces obtained. An obstruction was met on passing the stomach-tube 42 cm. from the incisor teeth, so that the stomach was probably entered only a short distance. There was bleeding after the passage of the tube and blood noted on the end of the tube. Analysis of stomach contents and vomitus showed a lack of free hydrochloric acid and low total acidity with mucus and blood. There were no Oppler-Boas bacilli. Leukocyte count was 8750. One examination of the urine showed albumin. Other examinations were negative.

Roentgen-ray plates were made after swallowing barium. You note the barium filling the esophagus except at its junction with the stomach, where there is a very marked narrowing (Fig. 319). An irregular shadow of some of the barium in the cardiac end of the stomach is also apparent. The *x*-ray report states that "there is a very definite indication of a lesion, which is undoubtedly a malignancy, involving the lower inch or so of the esophagus and extending into the cardiac end of the stomach. It is causing a partial obstruction."

In this case the findings all point to a carcinoma involving the lower end of the esophagus and cardiac end of the stomach with an obstruction which allows scarcely anything to pass. There are metastatic nodules in the subcutaneous tissue of the umbilical region and probably metastases in the liver and mesenteric lymph-nodes. The patient has lost in weight and strength since coming to the hospital and now consents to a gastrostomy. On account of his condition we will do this under local anesthesia, using $\frac{1}{2}$ per cent. novocain with adrenalin.

OPERATION

After infiltrating the tissues with the anesthetic we make an incision $3\frac{1}{2}$ inches long to the left of the median line, separating the fibers of the rectus muscle. After infiltrating widely, the posterior sheath of the rectus with the peritoneum is incised and the hand inserted. A hard nodular carcinoma is felt involving the fundus and cardia of the stomach. There are nodules in the liver and the mesenteric lymph-nodes are large and hard. No free fluid is present.

An uninvolved part of the stomach wall is picked up and a purse-string suture of chromic gut inserted. A small incision is made in the center of the area surrounded by the purse-string. It is noted that only the serosa and muscularis have been penetrated. It is necessary to pick up and incise separately the mucosa. On account of the loose attachment of the mucosa I have noticed difficulty in attempting to penetrate into the lumen with a single puncture of the knife. We then insert a No. 25 (French) catheter and draw the purse-string suture tightly about it. A second purse-string is inserted about $\frac{1}{3}$ inch from the first. Several Lembert sutures attach the stomach wall with the catheter to the peritoneum and fascia. The abdominal wall is closed as usual, with the catheter projecting from the center of the incision.

NOTE.—*Postoperative History.*—Feeding of liquids through the tube and by rectum was commenced at once. The patient, however, continued to lose, and finally died November 3, 1916, about a month after operation. Autopsy was not obtained.

BILATERAL RENAL CALCULI

Summary: Signs and symptoms of renal calculi and methods of examination as illustrated by the present case; instrumental dilatation of ureters to assist passage of stones; pyelotomy.

This man is a machinist, thirty-five years old, He entered the hospital February 27, 1917, with the complaint of pain in the right side, radiating to the genitalia, nausea and vomiting, hematuria, pollakiuria, and diminished urinary stream.

He felt perfectly well until three weeks ago, when he had an attack of pain in the right lumbar and hypochondriac regions which radiated to the penis, and, after lasting two and a half hours, was relieved by taking medicine. The abrupt stopping of the attack was preceded by a sharp, cutting pain in the penis. He felt immediate relief, but did not notice whether or not a stone passed with the urine.

His present attack began February 27th about 3 A. M., with a sharp pain in the right lumbar region. It was colicky in character and persisted all day without intermission. It extended around to the abdomen, and on urination radiated down the penis and scrotum. He was nauseated several times, but vomited only once. There was considerable retching.

There has been blood in the urine with both attacks. Five days before this attack the urine was bright red with blood. Patient states that there has been blood in the urine every few months during the past five or six years. He often passes clots and white bits of tissue at the end of urination. There has been frequency of urination during the present attack. Previous to this he was in the habit of getting up once or twice at night. The day he entered the hospital he had two chills and his appetite was poor. He further states that he has often had pain in the left lumbar region during the past five or six years, but not severe enough to keep him from work.

Habits.—Drinks whisky in moderation and smokes cigarettes to excess.

He had typhoid fever twelve years ago. He has had hemorrhoids for the past nine or ten years. He had gonorrhea fifteen years ago. He denies lues.

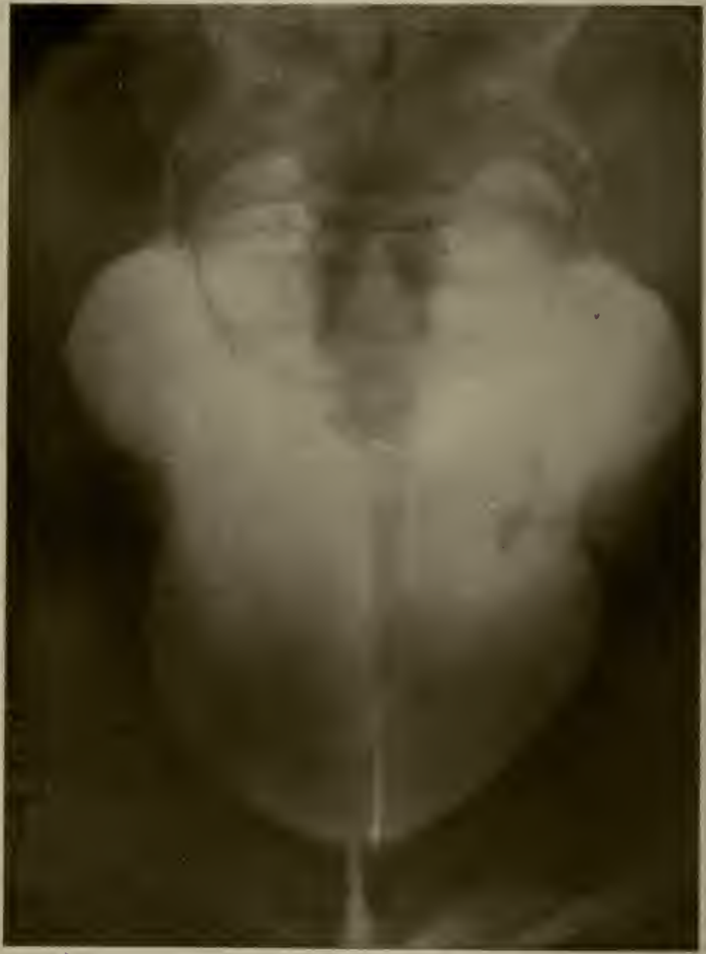

Fig. 320.—Roentgenogram showing stones in intravesical portion of right ureter.

Examination showed the patient to be well developed and not acutely ill. There was slight abdominal tenderness on the right, but no rigidity, and the kidneys were not palpable. Rectal examination was negative.

On examination of the *x*-ray plates we note two shadows just below and internal to the right ischiac spine, in the region of the lower end of the ureter (Fig. 320). The size and irregular shape of the lower shadow speaks for a stone in the ureter, and against these shadows being calcified areas in vessels or lymph-nodes. The plate of the left kidney shows a shadow, triangular in shape, 2.5 by 2 cm., well out from the median line behind the twelfth rib (Fig. 321). This is pretty surely a kidney-stone in the substance of the kidney or in one of the calices.

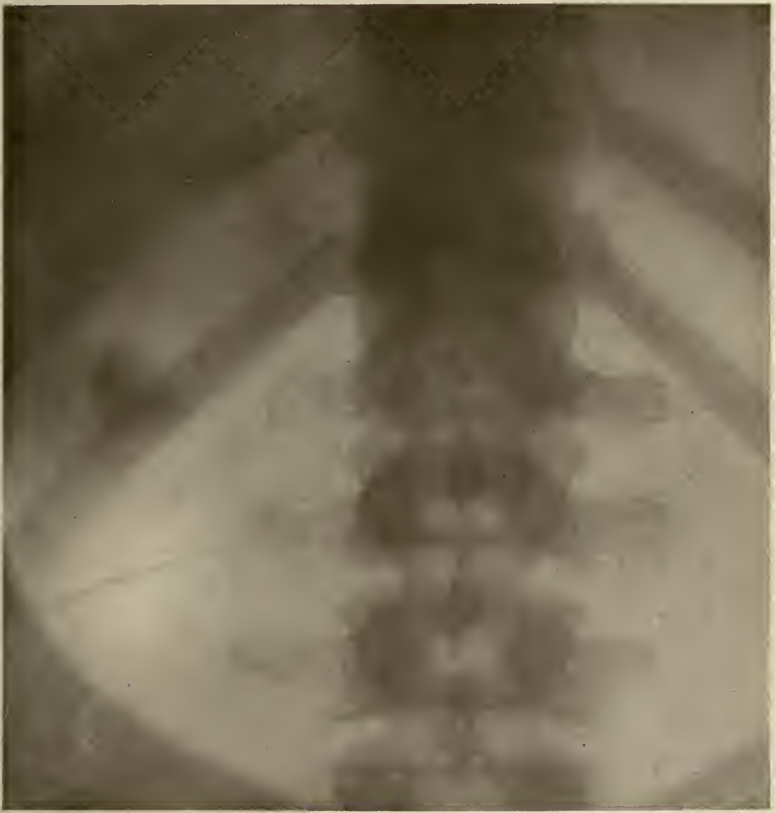

Fig. 321.—Roentgenogram of left kidney region. Note shadow of calculus at about the middle of the twelfth rib.

March 1, 1917: Cystoscopic examination showed congestion of the bladder mucosa, especially marked about the right ureteral orifice. There was seen a distinct bulge in the bladder wall in the course of the ureter about 2 cm. from the ureteral orifice. A No. 6 catheter met an obstruction about 2 cm. up the right ureter. The right ureteral orifice was dilated to No. 20.

March 3, 1917: The patient passed three small stones (Fig. 322) in the urine, preceded by cutting pain in the penis. Since then there has been complete relief..

March 14, 1917: Phthalein test showed diminished function on the left and a total of 35 per cent. in three and one-half hours.

OPERATION

March 15, 1917: Today we shall endeavor to restore this left kidney to its full functional capacity in so far as that may be done by the removal of the calculus which our *x*-ray study has assured us is present. We make the usual oblique lumbar incision, extending from the angle made by the twelfth rib and the sacrospinalis muscle downward and outward, about an inch above the anterosuperior spine of the ilium, and, if necessary, for a short distance anteriorly, parallel to Poupart's ligament. This incision we carry through skin, fascia, and muscles, being careful to avoid the ilio-inguinal nerve, down to the perirenal

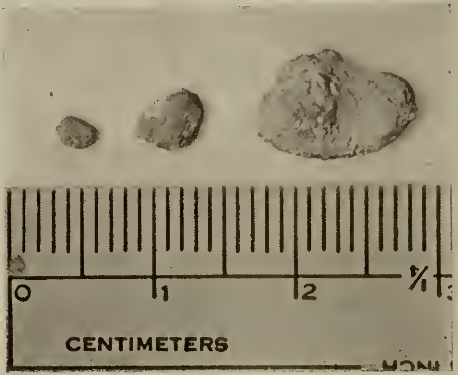

Fig. 322.—Stone passed spontaneously following instrumental dilatation of right ureteral orifice. (See Fig. 320.)

space. The fatty capsule of the kidney is split, and the kidney is delivered into the wound with comparative ease. As I palpate this kidney I feel a definitely circumscribed, hard mass, evidently a stone, toward its lower pole, which does not move into the pelvis of the kidney. Exposing the posterior surface of the renal pelvis I incise it, and upon exploration of the pelvis with a small curved forceps I am able to grasp and remove this calculus (Fig. 323) from one of the calices.

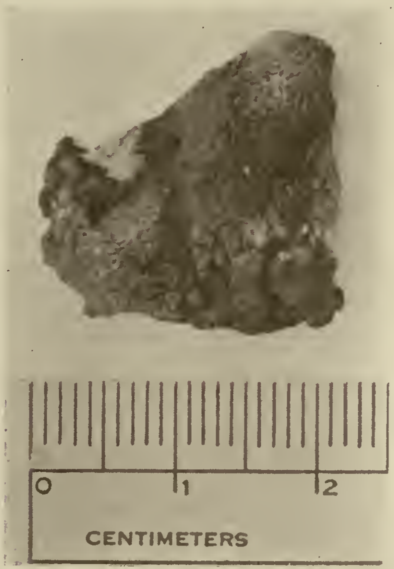

Fig. 323.—Stone removed through pyelotomy incision on March 15, 1917. (See Fig. 321.)

I shall close the incision in the pelvis with two or three catgut sutures and sew up the lumbar incision in the usual way, leaving a cigarette-drain in place to take care of any possible leakage from the wound in the pelvis. We shall expect this man to make an eneventful operative recovery and to remain free from symptoms for a period at least. Permanent recovery cannot be guaranteed because we know that renal calculi recur in a small percentage of cases, and this man's calculus-forming propensities are more than ordinarily well marked, as shown by the multiple bilateral calculi which you have seen this morning.

TETANUS FOLLOWING A BURN: INTRAVENTRICULAR INJECTION OF ANTITOXIN

Summary: Diagnosis of tetanus; treatment; technic of intraventricular injection of antitetanic serum; reason for this procedure rather than intraspinal injection in present case.

This man, forty-two years old, was brought to the hospital December 26, 1916, suffering with a burn of the back. He stated that his shirt had accidentally caught fire three days previously. There was little pain, and thinking it would not amount to anything, he applied lard and vaselin. After several days he developed headache, anorexia, and nausea, and so entered the hospital for treatment.

Examination on entrance showed the patient to be a well-developed man with a burn of first, second, and third degrees, involving the entire back, from the neck to the middle of the sacrum and from axilla to axilla. Four-fifths of the burned area showed a tough, greasy, leathery covering of necrotic skin with foul odor. Examination was otherwise negative

The involved area was cleaned surgically and subjected to the open-air treatment. He grew gradually weaker and began to run a temperature of 99° to 101° F. During the night of January 9th he first complained of inability to open the jaws widely in eating. He then stated that he had noted a little stiffness of the jaws for two days preceding. The mouth could be opened about $\frac{1}{4}$ inch. Slight stiffness of the neck and a slight Kernig sign were present. A probable diagnosis of tetanus was made, and 12,500 units of antitetanic serum were given intravenously. Chloral by mouth and magnesium sulphate, 25 minims of a 25 per cent. solution by deep hypodermic, were also given by the intern. All loose necrotic tissue was removed from the burned surface and peroxid of hydrogen applied. The patient had a slight convulsion during this procedure.

At the present time (January 10th) you note that the patient, lying on the abdomen, shows an extensive necrotic area on the back. His face has a peculiar drawn appearance, the corners of the mouth being drawn into a typical risus sardonicus. There is some dyspnea and some difficulty in swallowing. The mouth can be opened about $\frac{1}{4}$ inch and cannot be pried open further. The head is retracted and the neck rigid. The platysma muscle is tense. There is rather marked rigidity of the abdominal and back muscles. The temperature is running about 100° F.

There can be no doubt that we have to deal with a case of tetanus. The maladies usually differentiated do not here come into consideration. Meningitis might simulate the condition, but the absence of mental disturbance speaks against it. Trismus, usually the first symptom of tetanus, is rarely present early in meningitis. It is probable that the tetanus bacillus was introduced before the patient entered the hospital, making the period of incubation at least fifteen days. This would seem to give a favorable prognosis if it were not for the extensive burn. There have been other cases reported of tetanus developing in burns, but the combination must be rare. It is not difficult to see, however, that conditions for its development might be favorable in a burn with necrotic tissue which had been treated in a filthy manner.

In the treatment of developed tetanus recent workers advocate the early injection of moderate doses (5000 to 10,000 units) of antitetanic serum intravenously and intraspinally. On account of the extent of the burn in this case it has been considered unsafe to make the lumbar puncture, so we have decided to introduce the serum into the lateral ventricle, as advocated by Kocher.

OPERATION

After infiltrating the scalp with $\frac{1}{2}$ per cent. novocain-adrenalin solution, an incision 2 inches long is made from the midline downward on a vertical line, passing just in front of the left external auditory meatus. A button of bone is then removed with a $\frac{3}{4}$-inch trephine just to the left of the midline. The dura is incised between two guy-rope sutures. A large vein is seen running across the center of the field in a sulcus. Wounding such a vessel would result in serious subdural hemorrhage, and is a strong argument against drilling the skull with blind puncture of the ventricle. The regular lumbar puncture needle is then introduced through the brain tissue to a depth of about 5 cm. straight into the ventricle. The cerebrospinal fluid does not begin to flow immediately, but after an interval begins to drop slowly from the needle. It is perfectly clear. In introducing the needle there is no feeling of lessened resistance as the ventricle is entered. The flow of cerebrospinal fluid from the lumen of the needle is the only sign that the ventricle has been entered.

After withdrawing a few cubic centimeters of fluid the serum is introduced by gravity, the container being connected with the needle by means of rubber tubing. It has required about twenty minutes to introduce 8000 units. The dura is closed with a catgut stitch and a button of bone of the inner table is replaced.

The patient states that he has felt no pain or discomfort during the procedure. It was noted, however, that he twitched several times. He will be kept on bromids and chloral, and tomorrow will be given another dose of antitetanic serum intravenously. We will not give magnesium sulphate further because of the danger to the respiratory centers.

SUBSEQUENT COURSE

January 11, 1917: Condition poor. Temperature 103.6° F. Talks irrationally. Generalized tremor. No convulsions. Pulse weak and rapid. Jaw, neck, and arms rigid. Great difficulty in swallowing. Rectal feeding.

January 12, 1917: Constant tremor; labored respirations. No definite convulsions. Unable to retain enemas. Trismus became more marked. Twitching became continuous, and patient finally became stuporous and died at 10 A. M., January 13th.

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SURGICAL CLINICS OF CHICAGO

Volume 1 Number 5

CLINIC OF DR. ARTHUR DEAN BEVAN

Presbyterian Hospital

BENIGN TUMORS OF THE BREAST, CHRONIC INFLAMMATIONS, AND CARCINOMA

Summary: Two clinics illustrating the surgical pathology, the differential diagnosis, and the treatment of breast tumors and of chronic inflammatory swellings.

BENIGN TUMORS OF THE BREAST AND CHRONIC INFLAMMATORY SWELLINGS

I WANT to show you this morning 3 interesting cases representing different types of benign tumors of the breast. Before operating upon the first case I want to go over this subject briefly so as to give you a rather broad picture of these benign tumors as we have found them in our own clinical work.

First of all, I should like to say that contrary to the older teaching that benign tumors were comparatively rare in the breast and that nine-tenths of breast tumors were malignant, we have found at least as many benign tumors as malignant. During the last few years there has been an increasing proportion until today I believe that we are seeing more benign tumors of the breast than malignant ones.

In regard to the varieties that are met with, we, of course, find tumors corresponding to all the different tissues that go to make up the mammary gland—lipomas, angiomas, fibro-adenomas, and cystadenomas being the most common.

I would, as the result of personal experience, suggest the following simple classification of tumors of the breast:

The common benign tumors come under the head of fibroadenomas and cystadenomas. These include the Schimmelbush tumors, the benign papillomas, and the benign cysts.

The rarer benign tumors of the breast are the angiomas, lipomas, chondromas, osteomas, atheromas, and dermoids.

The malignant tumors are the carcinomas and sarcomas. Under the general term "carcinoma" I would include carcinomatous cysts and malignant papillomas. In our own work we have certainly had more than 20 carcinomas to 1 sarcoma. I am led to regard sarcoma of the breast, from our own experience, as a comparatively rare neoplasm.

Looking at the clinical problem in the simplest way I would say that fibro- and cystadenomas and carcinomas form certainly more than 95 per cent. of the breast tumors that come to our service. Therefore, the question that, as a rule, must be answered when a woman with a breast tumor presents herself for diagnosis is, "Is this a carcinoma or a fibro- or cystadenoma?"

Of the benign tumors the commonest forms are the fibroadenomas, tumors with a definite capsule composed of fibrous tissue containing tubules lined with epithelium, the proportion of fibrous tissue and epithelial elements varying in different cases. Next to the fibro-tissue and adenomas in point of frequency come the cystic tumors of the breast. These are sometimes simple cysts, lined with epithelium and containing clear, yellowish, or turbid fluid. For the most part they are true cysts and not retention cysts. Occasionally we find one of these cysts which has at one point in the wall a beginning carcinoma. In these cases we find, as a rule, the fluid is bloody, which is suggestive of such a carcinomatous condition. In addition to the simple single cysts we find occasionally papillomatous cysts and cysts containing warty ingrowths. These may be either benign or malignant, as we find in papilloma of the ovary.

There is in point of frequency a third group which comes under the head of Schimmelbusch tumors. These were regarded by the older surgeons and pathologists as the results of chronic mastitis until Schimmelbusch pointed out to the satisfaction of most of us that these tumors are true neoplasms and not the result of a chronic inflammatory process. A Schimmelbusch tumor is made up of a great number of cysts varying in size from very small cysts the size of a pea to cysts as large as an

English walnut. The process is sometimes limited to a small part of the gland, and in other cases it involves a large portion of the mammary gland, sometimes the entire gland being involved in the neoplasms. My own impression is that these Schimmelbusch tumors are essentially benign and we have found little tendency to regional or metastatic involvement, and where the tumors have been widely excised the prospects of permanent cure without further invasion of the breast are excellent. There are, however, some of these tumors, consisting of a great number of cysts containing papillomatous ingrowths, which are malignant in the same sense that many papillomas of the ovary are malignant, and, like papillomas of the ovary, they shade from purely benign tumors through all grades to those that are intensely malignant.

There is another class of tumors which consist of epithelial growths in the mammary gland, tubules, and in the milk-ducts. These are very apt to be associated with a clinical picture of bleeding from the nipple, the hemorrhage coming from the papillomatous growths in the ducts. These must be classed on the borderline between benign and malignant neoplasms. My colleague, Dr. Dean Lewis, has described these tumors in an article on Bleeding Nipples.[1]

On the whole, it is not difficult to make a differential diagnosis between benign tumor of the breast and malignant tumor in all but a small number of cases, the one important differential point being that the malignant tumors infiltrate the surrounding mammary gland tissue, so that they give one the sense of being embedded in the tissue, frozen into the tissue, and having finger-like processes radiating out from the primary focus, making a fixation of the tumor so that it cannot be moved freely in the gland tissue. A benign tumor, on the other hand, gives one no such sense of infiltration into the surrounding tissue. A fibro-adenoma or simple cyst or Schimmelbusch tumor can be easily moved in the mammary gland tissue, and this one point alone is, as a rule, sufficient to make a differential diagnosis. Not infrequently benign tumors are multiple, and, as you all know, multiple carcinomas of the breast are exceedingly rare. In fully 90 per cent. of the women who come to me with benign tumors I unhesitatingly make a definite clinical diagnosis, stating to them that they have a tumor of the breast, but because of its movability it is almost certainly benign. In the small minority where the evidence is not definite I make the statement that I cannot tell what the character of the tumor is until it is removed and examined microscopically. What advice are we to give a woman who comes to us with an apparently benign tumor of the breast? I think, as a rule, these tumors should be removed. The one great important matter to settle is that of the exact character of the tumor, and this, of course, can be done by removing it and submitting it to microscopic section. There are a few cases where the evidence in favor of benignancy is so definite, and where the tumors are movable and of small size and not disfiguring, where we can very properly assure the patient that the tumors are benign, and advise against any operative procedure unless they grow to a size which in itself is annoying.

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[1] Surgery, Gynecology, and Obstetrics, 1916, xxii, p. 666.

I am quite willing to accept the general proposition that a woman with a breast tumor should be operated upon even though in all probability the tumor is benign. This is of service in two ways—it settles the diagnosis definitely and removes what is in many cases a definite source of worry.

In regard to the surgical technic, I shall this morning have an opportunity of illustrating the special steps of the operations which we employ in this clinic for benign tumors. The first case which I shall operate upon is a young woman of thirty-two, who presents a small nodule in the right breast about as large as a hazelnut and very movable. She has known of its existence for a number of months. There is no tendency to dimpling of the skin over the tumor. It is not tender. She has had no pain in the breast. There is no enlargement of the axillary glands. I am not absolutely sure as to whether it is a small cyst or a fibro-adenoma. It is within about $1\frac{1}{2}$ inches of the nipple and is apparently just under the skin and superficial fascia, that is, superficially situated in the mammary gland.

In a case of this kind I select a local anesthetic and, as you see, infiltrate the skin and superficial fascia in a line radiating out from the nipple over the center of the tumor for a distance of about 2 inches. I have the assistant fix the mammary gland between the thumb and finger so as to prevent any change in the position of the tumor during the operation. Cutting down through the skin and superficial fascia the tumor comes into view. It has a definite capsule and is hard and firm. With sharp, fine dissection I remove the tumor and its capsule from the surrounding mammary gland tissue. There is a little bleeding from two or three small vessels. This is controlled with artery forceps (Fig. 324).

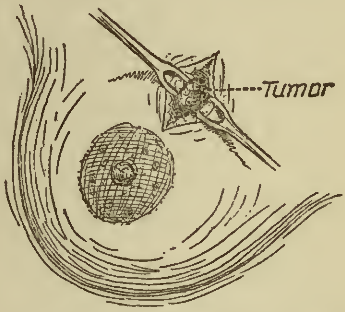

Fig. 324.—Enucleation of small benign tumor under local anesthesia through radial incision.

We have now removed the tumor, and I split it open with a sharp knife and find it is a hard, firm mass of tissue, evidently a fibro-adenoma. The dead space in the mammary gland from which the tumor has been removed is closed with two fine catgut sutures. Two very fine catgut sutures are used to close the superficial fascia over the gland and the small incision over the tumor is closed with black linen. In a case of this kind where the tumor is small and the hemorrhage is easily controlled I do not employ any drainage, but where we remove large tumors from the breast, leaving a large raw surface, it is, as a rule, best to introduce a small piece of gutta-percha or a small collapsible rubber tube. I leave this in one angle of the incision for twenty-four hours so as to prevent an accumulation of blood or primary wound secretion. We shall, of course, examine this tumor carefully microscopically.

Postscript.—Later the tumor was examined and shown to be a benign fibro-adenoma.

The second case which I shall operate on is that of a woman in whom we have made a diagnosis of a rather large benign tumor, probably a single cyst. It is situated in the lower outer quadrant of the right mammary gland and is about the size of a hen's egg. It is movable and painless, and was discovered recently accidentally while she was bathing. I am not absolutely sure of the diagnosis, but it impressed me as probably a large single cyst.

In these cases we have adopted a plan of incision that has been very generally employed for a number of years, a curved incision in the groove at the outer border of and beneath the mammary gland. This incision is covered by the mammary gland when the woman is erect, so that it is not visible and is in no way disfiguring. In operations for large breast tumors in which I employ this method of removal I prefer to use a general anesthetic rather than local anesthesia, although the operation can be done quite well under local anesthesia. There is, however, a certain amount of drawing and pulling in turning the breast upside down, as we do in the course of the dissection, which is uncomfortable to the patient even under a good local anesthetic. Under ether anesthesia, therefore, I make an incision about 4½ inches in length at the outer and under part of the breast. This divides the skin and superficial fascia and the edge of the mammary gland comes into view. This is pulled up, exposing rather loose areolar tissue between the mammary gland and the pectoralis major muscles. This areolar tissue is divided and the mammary gland is turned upside down, so that the portion of it containing the tumor is brought out through the incision. This is well shown in the chart which I have on the board (Fig. 325). The tumor can be very easily felt. With a sharp knife the mammary gland tissue in immediate contact to it is dissected out. It proves to be, as you see, a large single cyst, the wall of which is lined with shining epithelium and it contains a turbid yellowish fluid. It is quite necessary to use a very sharp knife in these cases because you will be surprised to find how hard the tissue of the mammary gland is. It cuts almost like fibrocartilage.

The large dead space from which this tumor is removed is now closed with medium-sized catgut, the two or three bleeding points are ligated, and the breast is dropped back into its normal position, and the curved incision at the outer border is closed with some very fine catgut through the superficial fascia and black linen through the skin. I introduce a very small collapsible rubber tube into the middle of the incision. This will be removed at the end of forty-eight hours. I find that this is a good rule, because if we do not provide for the escape of some little oozing and primary wound secretion we are very apt to have an accumulation of serum, which will require reopening of the wound at one point so as to permit of its escape, usually some time between the fifth and the eighth day. If, however, a tube is left in for forty-eight hours this is usually avoided.

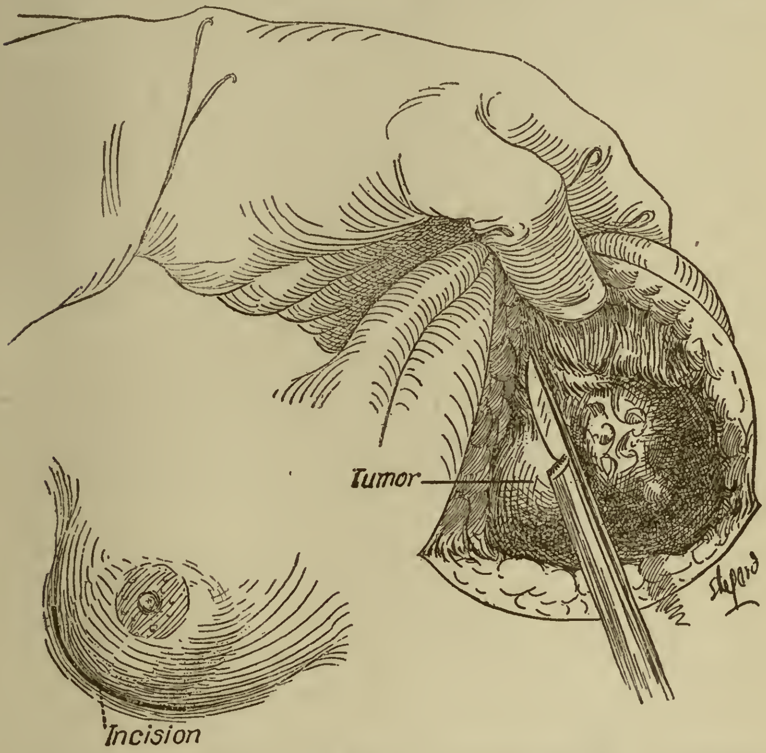

Fig. 325.—Enucleation of large benign tumor through incision made beneath breast. The organ may be turned upside down through such an incision and any portion of the gland resected. After healing has occurred the scar is entirely hidden by the breast itself.

The third case is a woman upon whom I have ventured to make a diagnosis of Schimmelbusch tumor. She has had the tumor to her knowledge for about three years. It involves at least one-third of the mammary gland. It is movable in the mammary gland tissue and at the same time is rather nodular. It does not give one the sense of a simple cyst nor of a fibro-adenoma, but rather the sense of a tumor made up of a great many cysts. One can be pretty sure that it is not a carcinoma because of the fact that the young woman has known of its existence for several years, and that there has been little change in the size and shape of the tumor during that time. There is no evidence of glandular involvement. There is an absolute lack of the infiltrating character of a malignant growth.

I shall in this case operate under ether anesthesia. I shall adopt the same plan of incision as in the case just operated upon. I shall make, therefore, a larger incision—about 6 inches in length—at the outer and lower border of the breast and, as I turn the breast upside down to expose its under surface, you can see shining through the thin fascia covering the under surface of the breast a number of small yellowish cysts. The process is so extensive and involves the mammary gland tissue so generally that I cannot do as I did in the last case and simply dissect out the tumor. It will be necessary to remove a large wedge-shaped section of the breast, certainly more than one-fourth of the mammary gland, going wide of the tumor and through perfectly normal mammary gland tissue. As you see, the shape of the section removed is very much like the wedge-shaped section that one would make in cutting a piece of pie. We have now removed the entire neoplasm, and with medium-sized catgut I shall sew the edges of the mammary gland tissue together through the entire thickness of the gland. This controls the hemorrhage and does away with the dead space that would otherwise exist, and although we have removed more than one-fourth of the entire circumference of the gland, there is surprisingly little resulting deformity. As in the previous case, we introduce a rubber tube for drainage and close the incision with catgut and black linen.

On cross-section you see, as I divide this tumor, that it is composed of a great number of cysts varying in size from a pea to a large butter bean. I have no doubt but that the microscopic section will show that it is one of those cases of cystic disease of the breast which we classify as Schimmelbusch tumor.

On the basis of the 3 cases which I fortunately have had the opportunity of showing you this morning I would like to say a few words in regard to the other benign lesions of the breast that simulate tumors and require to be differentiated from them. I would like to mention first tuberculosis of the breast. We have had a number of these cases in the clinic. One of my assistants, Dr. Gatewood, has recently reported them.[1] They offer, as a rule, confusing clinical pictures. Sometimes they are diagnosed as carcinoma, sometimes as benign tumors, and sometimes as abscesses of the breast. They occur, as a rule, as multiple nodules in the breast, and unless associated with a mixed infection, they are not painful and have little redness and swelling about them until they come to the surface of the skin, where, as in similar cold abscesses from cervical lymphatic glands, they may become adherent to the skin, break down, and discharge. Where they occur in individuals who are the subjects of general tuberculosis and the process is somewhat advanced, the diagnosis can be made with a fair degree of certainty. In ordinary cases, however, without such associated evidence the diagnosis is not made until the lesion is operated upon and sometimes not until the microscopic examination of the tissue removed has been made. In the very early stages before they have broken down the lesion is a mass of tuberculous granulations. A little later caseation occurs and the caseating mass is surrounded by a wall of rather dense connective tissue. Where the lesion is single and deeply situated in the breast, occurring in women of cancer age and associated with a certain amount of chronic inflammation around the focus, the picture may be quite suggestive of carcinoma, and I have in several cases operated, with the probable diagnosis of carcinoma, and found one of these single tuberculous nodules. Where they are movable, of course, with the picture that I have already described, the evidence would be against carcinoma and in favor of tuberculosis.

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[1] Jour. Amer. Med. Assoc., 1916, lxvii, p. 1660.

The question of treatment in these cases is rather interesting. We have cured some of them where the process was limited by excision of the portion of the breast tissue involved. In other cases, however, the process involved so much of the mammary gland tissue that it was necessary to remove the entire gland.

A second picture which we have found in a few cases is that of actinomycosis of the breast, secondary, of course, to lung actinomycosis and extending through the pleura and through the chest wall to the mammary gland. These cases are confusing and are apt to be mistaken for tuberculosis. The differential diagnosis must be made, however, upon the finding of colonies of ray fungi in either the pus or tissue removed. There is, however, one suggestive characteristic, that is, the wooden-like infiltration that is found in actinomycosis generally.

A third condition which we have found in a few cases is that of syphilis of the breast. I have found this both in the male and in the female. I can remember very distinctly 2 cases of this kind that made a great impression upon me, one a man of about forty from whom I removed a breast tumor the size of an almond. It was rather yellowish and firm. I dissected it out completely, but after wound repair a considerable induration was left which gradually developed a mass larger than the tumor which I originally removed. On sectioning carefully it was found to be a gumma, and the induration entirely disappeared under mixed treatment. The second case was that of a woman who had had one breast amputated for supposed carcinoma several years before. She came to me with a mass in the remaining breast. On going over the case very carefully we found a positive Wassermann and very definite earmarks of general constitutional disease. On that account we put her on mixed treatment before suggesting operative interference, and on the mixed treatment the induration in the breast disappeared entirely. It is at least probable that the tumor in the breast which had been operated upon was of the same character.

I cannot leave this subject without referring to another condition of the breast which has interested me very greatly and which for a time seemed to present a very difficult problem, but which I have learned to handle with a good deal of satisfaction, and that is the subject of long-standing chronic inflammatory lesions of the breast associated with multiple abscesses and fistulæ, the result of a pus infection. We have had to deal with this problem a number of times, and I have seen now a good many of these cases which had received treatment in the hands of quite competent men for a good many months, and which would come to us riddled with abscesses and fistulæ, and with the desire of the patient to have a radical operation done and the breast removed rather than to suffer from the continued annoyance and distress of the condition. Where these multiple abscesses and fistulæ of the breast are handled by simple incision and the introduction of drainage-tubes they very often become chronic and are not cured. We have found, however, that they practically all can be cured by a thorough operation under an anesthetic, opening up all the abscess cavities and scraping out all the fistulous tracts, and then not introducing any drainage-tubes, but applying moist dressings under a very firm compression with a bandage. It is surprising how these cases will heal up if firm pressure is made over the breast and the breast kept at rest after the abscesses and fistulous tracts have been thoroughly cureted out. My attention was first called to the importance of a thorough cureting of these abscesses and fistulous tracts and the application of pressure by the late Dr. Charles T. Parkes, who at that time employed the technic which I think was original with him, although I am not sure as to this point. After thoroughly cleaning out these abscesses and fistulous tracts he would apply over the breast a large flat sea-sponge which had been sterilized and flattened under an old-fashioned letter-press. About two of these flattened sea-sponges were put over the breast and held in position by firm gauze bandage and a large dressing. The sea-sponges were moistened with boric solution. These flat sponges which would come out from under the letter-press not more than $\frac{1}{4}$ inch in thickness would swell up to sponges 1 inch or $1\frac{1}{2}$ inches in thickness. They would exert an even, well-distributed pressure over the breast under the bandage. I think this is an excellent plan of applying this treatment. At the same time we have found very admirable results by simply using very massive gauze dressings held very firmly in place by gauze rollers and applied so as to make an even, continued pressure. I have in so many cases been able to prevent the removal of one of these chronically inflamed breasts and to cure the patient completely by this rather simple surgical procedure that I should like to emphasize the great value and importance of it in this general discussion of breast lesions.

CARCINOMA OF THE BREAST

The first case that I shall operate on this morning is a woman of about forty years of age, who comes to the clinic with the history of having noticed a general hardening in the right breast three or four months ago. She went to her family physician, who, on examining the condition, told her that it was a chronic mastitis, gave her some simple directions for treatment, and expressed the opinion that the trouble would disappear in a short time. She now has, as you see, a retraction of the nipple. On superficial examination the breast appears to be very much like the one on the opposite side, but examining it by palpation the breast is found to be very hard, firm, and slightly tender. I cannot make out any enlarged glands in the axilla. There has been no bloody discharge from the nipple and there is no evidence of an eczematous condition about the nipple, as is sometimes noticed in these cases.

My clinical diagnosis here is quite definitely an enormous carcinoma involving almost the entire mammary gland with a resulting retraction of the nipple. We shall proceed to do an extensive radical operation under ether anesthesia. I have little sympathy with doing these radical breast operations under local anesthesia, as is being done by a number of men. I think it is stretching altogether too far the proper field of local anesthesia. We shall, in this radical operation, remove in one block of tissue the skin widely over the mammary gland, the mammary gland itself, the underlying pectoralis major muscle, and the axillary fat and lymphatics. The plan of incision, which we have adopted in this clinic and which we believe is the one best suited for this work, is well represented in Fig. 326. We do not claim any originality in this operation, but feel very strongly that it is, on the whole, the best operation that has been devised for the radical removal of the breast.

As you see, the skin incision begins on the upper part of the arm at the point of insertion of the pectoralis major muscle into the humerus, and is carried downward and inward over the pectoral muscles for several inches, and then divides to include a large area of skin over the mammary gland, and then unites again into a single incision over the point of origin of the rectus abdominis. Where the carcinoma is small and situated close to the

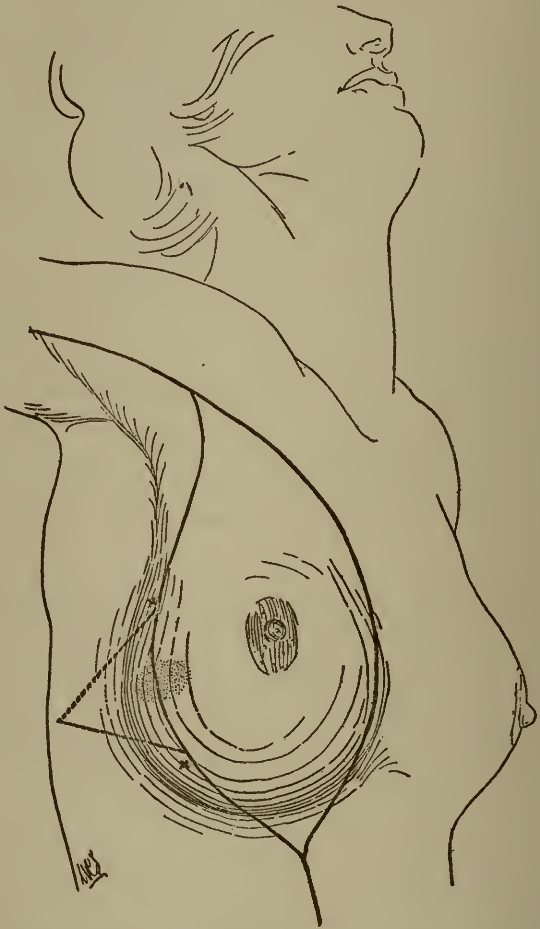

Fig. 326.—Outline of incision for radical operation on breast. Dotted lines indicate method of enlarging incision to include suspicious areas.

nipple the amount of skin that requires removal is, of course, less than in an extensive carcinoma like this. Wherever possible, I attempt to plan the operation so that the skin incision can be closed completely without any skin-grafting. Where the carcinoma is situated at the periphery of the mammary gland and there is any possibility of the overlying skin being involved, a wedge-shaped area of skin is removed at that point so as to get widely away from the lesion (Fig. 326). As you will see, it is very important in making the skin dissection to dissect the skin back, going very close to the derma, so as to avoid leaving any of the mammary gland tissue. I have now dissected the integument back on the inner side to the sternum and on the outer side as far back as the latissimus dorsi muscle, and I have exposed at the lower angle of the incision the sheath of the rectus abdominis. I am careful in the dissection of the axilla to dissect back a flap of skin as far as the latissimus dorsi and the teres major muscles that form the posterior border of the axilla. I now elevate the pectoralis major muscle from the chest and with curved clamps I clamp the muscle very close to its point of origin from costal cartilages and sternum, and cut the muscle with a strong pair of scissors close to the clamps. I am careful in doing this to clamp the perforating branches of the internal mammary artery firmly with artery forceps opposite the corresponding intercostal spaces. As I come up to the line on the pectoralis major where the sternal and clavicular portions unite I split the muscle-fibers so as to expose the nerves and blood-vessels in the costocoracoid membrane. These are ligated and divided. Passing outward with the knife I divide the insertion of the portion of the pectoral muscle to be removed close to its attachment in the external ridge of the bicipital groove of the humerus. With great care now I expose the axillary vein, which is the guide that is always to be looked for in the dissection of the axilla. It comes into view as this large bluish vessel about the size of my little finger, and is the most superficial of the important structures of the axilla. With two pairs of blunt dissecting forceps and with some gauze I very carefully dissect out all the axillary fat and lymphatics. In doing this it is necessary to divide the two intercostohumeral nerves running from the thorax through this mass of fat to the arm. It is also necessary to clamp and ligate five or six good-sized veins passing from the axillary fat into the axillary vein and with these some small arterial branches (Fig. 327). Care is taken at the lower part of the

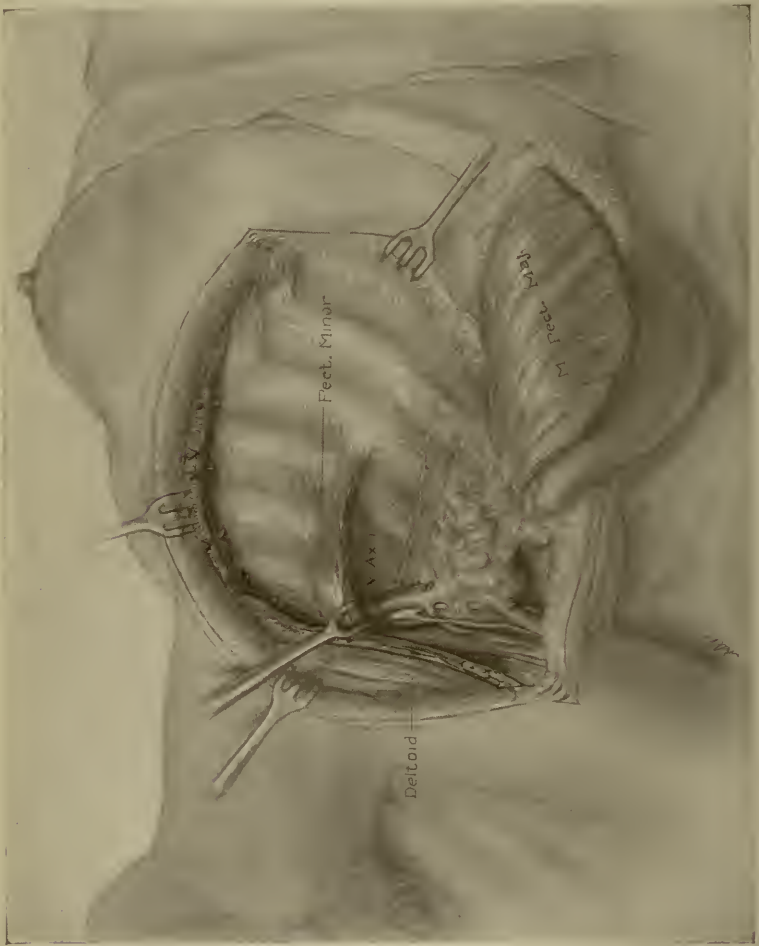

Fig. 327.—Removal of block of tissue including overlying skin, all of the breast tissue, sternal portion of pectoralis major, and axillary fat and lymphatics. The intimate relation between involved lymphatics, axillary fat, and other structures, particularly the axillary vein and its branches, is well shown.

axilla not to injure the subscapular nerves. I now remove the entire block of tissue consisting of the overlying skin and mammary gland with the underlying pectoralis major muscle, the axillary fat, and lymphatics.

I have used, in this operation, probably forty or fifty artery forceps and I have clamped them very tightly. I now ligate all the small vessels that lead directly to the axillary artery and vein. I then remove one after the other the clamps that are in the skin and superficial fascia and the clamps which I placed on the origin of the pectoralis major and on the perforating branches of the internal mammary artery. I look at these one after the other carefully as I remove them, and, as you see, very few of them bleed at all. Whenever there is, however, any hemorrhage whatever the clamp is reapplied and that portion of the tissue ligated with fine catgut. The huge wound left by this dissection is now perfectly dry. I make a small stab-wound about $\frac{1}{3}$ inch in length through the skin of the axilla and carry through this into the axillary space a soft, collapsible rubber tube. The skin incision is then closed with sutures of silkworm-gut placed 2 or 3 inches apart and a continuous suture of fine black silk or black linen (Fig. 328). A large soft dressing is applied. No effort is made to incorporate the forearm in the dressing. The woman is allowed free use of the forearm from the time of the operation.

In regard to the after-treatment and postoperative history: We have had practically no mortality in a large series of these radical operations. There have been but two exceptions to this rule, one a case years ago in which the patient died some weeks after a very extensive breast amputation from an attack of erysipelas following an attempt to skin-graft a large area the size of my two palms; the other, a case where a palliative operation was done for the removal of a huge sloughing carcinomatous mass, in which about ten days after the operation the patient died suddenly of secondary hemorrhage from the axillary artery. The immediate prognosis, therefore, is excellent, probably better than in any other extensive operation in surgery. We allow these patients to sit up the day following the operation. The stitches are removed in from eight to ten days, and the small rubber tube in the axilla in from three to four days. The patient is allowed, as a rule, to leave the hospital at the end of ten days.

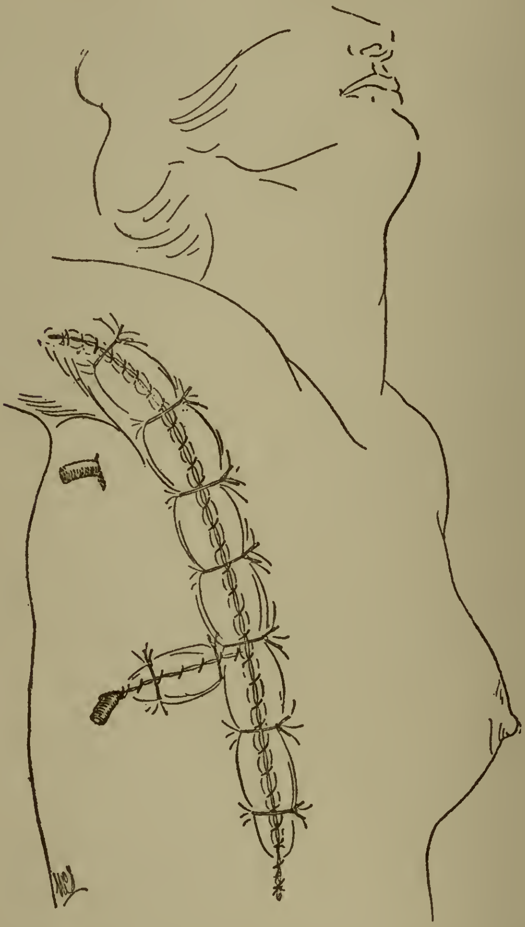

Fig. 328.—Incision closed with interrupted tension sutures of silkworm-gut and continuous skin suture of black waxed silk or linen. Note drainage-tubes (collapsible rubber) in dependent portion of wound.

We have for a long time advised a course of x-ray treatments after these breast amputations with the idea that this might give some additional assurance against recurrence. The argument in favor of this position is, I think, sound. We have seen a good many carcinomatous nodules that have developed in the skin after the radical operation of the breast disappear under *x*-ray exposure. It seems reasonable to suppose that the microscopic nest of cells from which these nodules spring would be destroyed much more easily immediately after the operation than when large palpable nodules manifest themselves. All advice to use *x*-ray treatments after these operations, however, should be conditioned with the statement that the exposures should be of a character that would carry with them no risk of burning the patient, because we have seen some very bad burns of the breast that caused great distress. On that account I very strongly urge these patients to have *x*-ray treatment given by some expert and with great care to avoid any possible burning.

What can we say in regard to the prospect of permanent cure? In this particular case I think that we can say that there is practically no prospect of a permanent cure because, when I made the dissection of the axilla, I found visible and definite strands of carcinoma involving the lymphatic vessels way up in the axillary angle just beneath the clavicle. I have learned from experience with 400 or 500 of these cases that that means invariably an extension into the lymphatics in the mediastinum and lymphatics in the neck. I regard an operation in a case with these findings as being purely palliative. It may give the patient a prolongation of life of two or three years, but almost certainly sooner or later continued growth of the carcinoma inside of the chest will make itself evident. In this connection I want to give you a good working rule which will enable you to form a mental picture of the extension of carcinoma through the lymphatics. The rule is this, that if you want to determine accurately and definitely the involvement of the lymphatics from the primary focus of carcinoma, investigate first the arterial supply of the area involved. With the arterial supply you have the return venous circulation, and with the return venous circulation you find the draining lymphatic vessels. Now apply this rule to the mammary gland. What is the arterial supply?

First: From the branches of the axillary artery.

Second: From the intercostal branches of the internal mammary.

Third: From the lateral branches of the intercostals proper.

Fourth, but not of very much importance: Branches from the deep epigastric passing up from the rectus muscle to the mammary gland.

With each one of these four sources of arterial supply you have a return venous supply and draining lymphatics. Therefore, you find with carcinoma of the mammary gland lymphatic extension first to the axilla accompanying the branches of the axillary vein; second, lymphatics passing into the anterior mediastinum accompanying the branches of the internal mammary vein; third, lymphatics accompanying the intercostal veins to the posterior mediastinum and the lymphatic glands in the posterior mediastinum; fourth, occasionally the lymphatics passing from the mammary gland downward toward the umbilicus with the deep epigastric vein.

My experience with carcinoma of the mammary gland has taught me that the favorable cases are the ones in which there is not as yet lymphatic gland involvement even in the axilla, and that whenever there is distinct lymphatic gland involvement in the axilla there is also probably lymphatic gland involvement in the anterior mediastinum, making the case where this involvement exists almost hopeless from the standpoint of radical cure. Now let us ask ourselves in regard to the prognosis from the standpoint of permanent cure. On this point there has been great diversity of opinion. For a time there was a great effort made, shortly after the introduction of the very extensive operation for the radical cure of breast cancer, to make it appear that these extensive operations had entirely revolutionized this work and that these operations were capable of giving a very high rate of permanent cures, some clinics reporting even as high as 40 or 50 per cent. A careful analysis of these statistics shows that they do not represent the real facts. The statistics reported from one of our best surgical clinics were based on a proposition which for a long time was not understood, although it was clear enough, and which, not being clearly understood, led to a general misconception of the findings. The plan in this clinic was to divide the cases into two groups: group one included the cases which, after the operation was completed gave, in the opinion of the surgeon, a prospect of permanent cure. The second group included those cases which, after the operation was completed, did not, in the opinion of the surgeon, give a prospect of complete cure, and this second group was not included in the final statistics. This handling of the cases naturally gave a very high percentage of cures after three years, much higher than the percentage obtained in the clinics where all the cases operated on were included in making up the final result. Then again, in some of the earlier work there can be no doubt that a good many cases of benign tumor were treated by the radical operation and reported, mistakenly, of course, as cancer cases. Considering all the evidence at hand, I think one may say that probably about 20 per cent. of the carcinoma cases that come to our active service show at the end of three or even five years no recurrence, and that this fairly represents the results that can be obtained by means of efficient modern surgery as applied to all the cases that present themselves. There can be no doubt whatever but that the propaganda that is being carried on now by a number of agencies, notably by the Society for the Control of Cancer, is educating the public so that these cases are coming to us earlier than formerly, and that with the earlier operations we shall be able to increase very materially the number of cases cured by radical operation. The basic principles involved in the surgical treatment of mammary carcinoma are now so well understood that there should be but very little difference in the results obtained in the different clinics. The one thing that we must strive to obtain is early recognition of the cases and early operative interference.

I am very much impressed with the fact that there is being done a lot of very bad medical management and bad surgery in connection with breast tumors and supposed breast tumors. There are two distinct phases of this subject that I should like to discuss with you briefly. First, the failure to recognize carcinoma of the breast by the general practitioner, and hence the failure to urge immediate radical operation; and second, unnecessary radical operations done on breasts for benign tumors and for imaginary tumors. In regard to the first subject, as a consulting surgeon I see almost every week patients who have advanced carcinoma of the breast that have been treated by their family physician as caked breast or chronic mastitis, or under some other diagnosis, where an expert would have recognized the fact that carcinoma existed and would have given the patient the benefit of an early operation. This mistake is so common that I like to take every opportunity possible to point it out. To one who has had a wide experience in diagnosing these cases the diagnosis seems so perfectly clear in 90 per cent. or more of the cases, even where the carcinoma is not larger than a bean, that it is difficult to understand how mistakes are so frequently made today. The gross examination of carcinoma of the breast gives one exactly the same impression that you obtain from examining a slide under the microscope, that is, that the carcinoma infiltrates the surrounding tissues, is embedded in the surrounding tissues, and that it has a tendency to draw toward the center of the lesions the strands of connective tissue that radiate out from it, so that if it is close to the skin there is a tendency to dimpling of the skin. These characteristics are so definite and are so different from benign tumors and inflammatory lesions that we have no hesitancy in making, in more than 90 per cent. of the cases, the immediate diagnosis from the clinical findings. In the small minority of less than 10 per cent. where there is a question about the clinical diagnosis, the position should be taken that the case should be immediately investigated, the patient gotten ready for the radical operation, and then before removing the breast the tumor cut into and the diagnosis made either from the gross section or, if there is the slightest doubt as to its character, from a frozen section made at that time, so that the radical operation can be done under that anesthetic.

The other phase, that of unnecessary radical operations for benign tumors and for imaginary tumors, is a very interesting subject, and one which I have studied with a good deal of care for a number of years. I certainly see more than 50 women a year who come to me with the fear that they have cancer, or with the statement that Doctor So and So has made a diagnosis of breast cancer and has recommended a radical operation, where, on the most careful examination, no neoplasm can be found. These are for the most part women who have rather lobulated breasts, the different portions of the mammary gland being separated by pretty definite septa of connective tissue, and where for some reason they have occasional pains in the breast, and because of the pain and this lobulated condition the physician makes a diagnosis of a tumor. Then again there are women who have what might be called "cancerphobia." Their sister or mother or husband or some member of the family has had cancer, and because of some twinge in the breast they have worried themselves into believing that they have a cancer developing.

Of course, I find not infrequently cases of clinically benign tumors which have been diagnosed as carcinoma, and the recommendation of a radical operation has been made. There was a time in the development of surgery of the breast when surgeons had altogether a wrong conception of the facts as to the frequency of benign and malignant tumors. The statistics of Gross and Billroth give about the same results, approximately 80 per cent. of carcinoma, 10 per cent. of sarcoma, and 10 per cent. of benign tumors of the breast. The results from my own surgical clinic and my own surgical laboratory have shown within the last few years that the majority of the cases that now come to us with breast tumors are benign. I think as a working basis we might say here that about half of the women coming to us with tumors of the breast have cancer and about half have benign tumors.

Now what are we to do with the benign tumors? I think we should accept the proposition that, as a rule, they should be removed. There are some exceptions to this, because not infrequently I find young women coming to me with small multiple fibroids in both breasts where the multiple involvement of both breasts, the age and character of the tumors, make it absolutely certain that they are benign, and one might very properly in such cases hesitate about disfiguring the breasts by multiple incisions where the benign character of the growth was so clearly established. On the whole, however, especially where they are single, it is a good rule to follow to remove the tumor and to submit it to microscopic examination and certainly not to remove the breast unless the evidence of malignancy demands it. These benign tumors are so readily diagnosed by the surgeon of experience that comparatively few mistakes are made in the clinical diagnosis. The movability of the tumor in the mammary gland tissue and the lack of the characteristic infiltration of a carcinoma make the differential diagnosis in the vast majority of cases clear and easy.

In regard to the principle that has been preached pretty generally that these benign tumors should be removed because they may become malignant, I desire to enter a strong protest. The experience in my clinic has shown that out of several hundred benign tumors which we have removed by local operation, but a single case as far as we know has been followed by a carcinoma of the breast later, and this was in a case which grossly was a simple cyst of the breast, and which under the microscope failed to show any malignant characteristics. A year later a carcinoma developed in that breast and the woman died of general carcinomatosis in spite of a radical operation. There are in this case two possibilities, one that the case was from the start a carcinoma and that we failed to recognize it, and the other possibility is that a carcinoma developed in this mammary gland which the year before had a simple cyst which was removed by operation. It certainly would not be surprising if out of several hundred women who had benign tumors of the breast there should be a certain small proportion in whom a carcinoma developed later, but certainly it is exceptionally rare, so rare that there is no fair argument to advise radical operation because of the risk of the development of this benign tumor into a cancer.

CLINIC OF DR. ALBERT J. OCHSNER

AUGUSTANA HOSPITAL

TALIPES EQUINOVARUS FOLLOWING ACUTE ANTERIOR POLIOMYELITIS: TREATMENT BY LENGTHENING THE TENDO ACHILLIS AND OVERCORRECTION IN A PLASTER CAST

THE patient, a boy of four and one-half years, was admitted to the hospital October 1, 1916, because of talipes equinovarus of the left foot.

His family history is negative. He was born at term, normal delivery. He had scarlet fever shortly after birth. When one year old, while teething, he was ill for about a month, during which time he was feverish. He had walked a little at the age of eleven months, but after the illness was not able to walk until he was about two years of age, and then he walked very poorly. He drags the left leg and throws the foot out when walking. He has grown well and is strong, but the walking seems to be getting worse. For about one year he kept the left arm flexed, but now it is practically normal.

PHYSICAL EXAMINATION

He is a well-developed and well-nourished child with a good color. Both tonsils are markedly hypertrophied. The neck, chest, heart, lungs, and abdomen are negative. Both arms are equal and strong and the right leg is normal. When he walks he keeps the left foot forward and swings it out somewhat. When he stands, it is on the ball of the left foot. The foot is kept flexed and the tendo achillis is very tense. The calf of the left leg is about two-thirds the size of the right, there being a difference of 3 cm. in circumference. There is paralysis of the peroneal muscles of the left leg and contraction of all the flexor muscles.

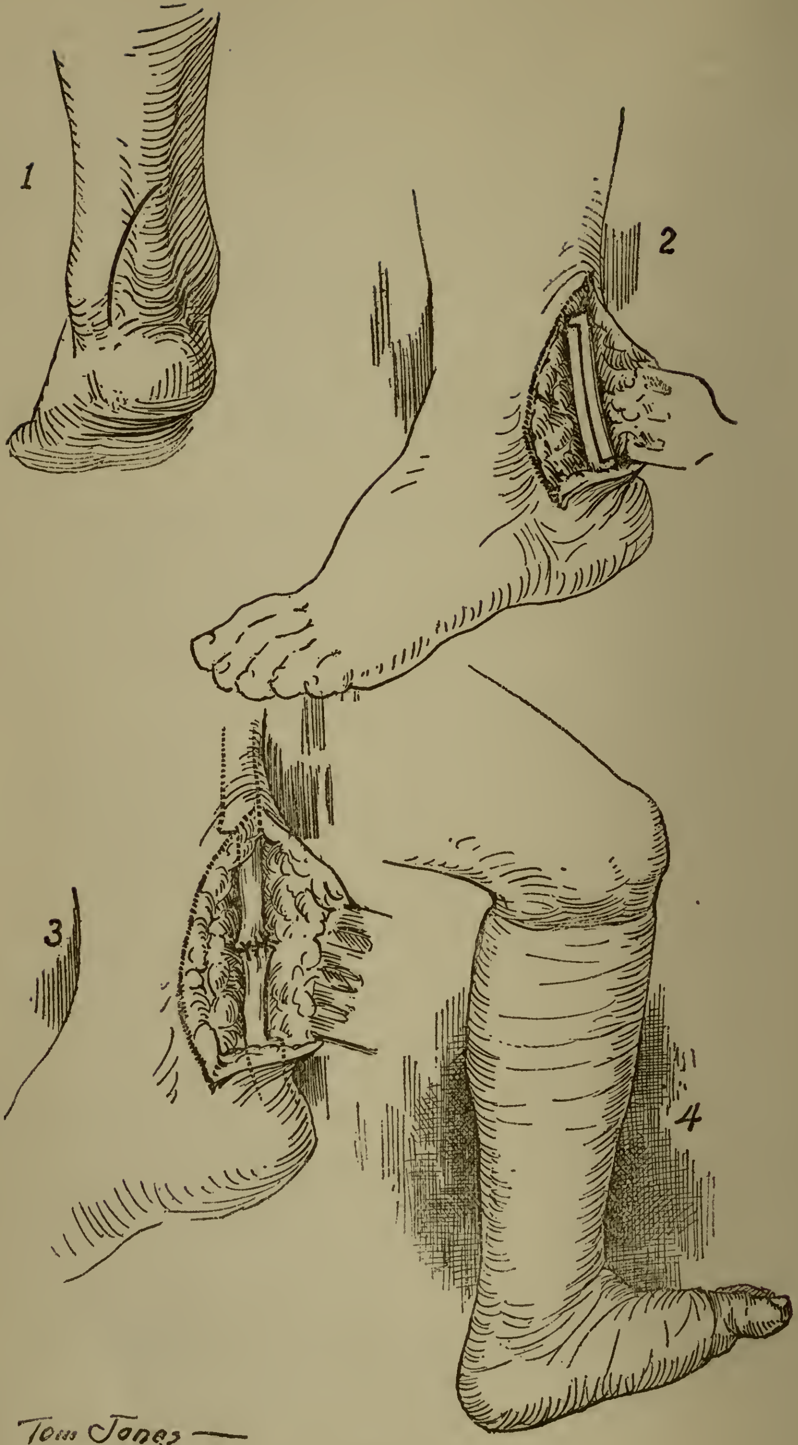

Fig. 329.

COMMENTS AND OPERATION

Dr. Ochsner (October 2, 1916): This patient had an attack of infantile paralysis with only a partial paralysis of the anterior muscles of the leg. In our experience the peroneal muscles have been involved in a larger percentage of cases and to a greater extent than the tibialis anticus. For that reason in these infantile paralysis cases we have more frequently talipes equinovarus than talipes equinus. Usually, therefore, the peroneal muscles have become weakened, while with time the tibialis anticus has gained slightly in strength and the gastrocnemius and soleus muscles have gained greatly in strength. In this case, however, the paralysis of the anterior muscles is uniform, while the gastrocnemius and soleus muscles have been splendidly developed and the peronei have not suffered at all. On the contrary, the relaxation of the anterior muscles has served to permit a contraction of the gastrocnemius and soleus muscles. In order to prevent an atrophy of the anterior muscles the patient's leg has been treated constantly by means of massage since the acute condition subsided. The ankle-joint is so arranged that the astragalus acts as a fulcrum against the lower surface of the tibia, and the contraction of the gastrocnemius and soleus muscles causes the foot to form an obtuse angle with the leg. Also a plane drawn backward on a parallel with the sole of the foot would form an acute angle with the leg. Mechanically, then, the gastrocnemius and soleus muscles predominate over the anterior muscles. In order to eliminate this we must secure a position for the foot which makes the angle between that and the leg an acute angle. In order to do this we expose the tendo achillis by means of a curved lateral incision, as indicated in Fig. 329, 1. The skin is carefully retracted by means of small retractors and the tendo achillis is then split longitudinally for a distance of 4 cm. (Fig. 329, 2) and cut off at the lower end by turning the scalpel outward, and at the upper end by turning the scalpel inward. The

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Fig. 329.—Dr. Ochsner's case of contracture of tendo achillis: 1, Incision. 2, Method of making longitudinal incision so as to lengthen the tendon. 3, The two cut ends sutured together. 4, Plaster-of-Paris cast applied in greatly overcorrected position.

foot is then flexed against the leg and the two free ends of the cut tendo achillis are opposed (Fig. 329, 3). Four fine chromicized catgut sutures are utilized to suture the ends of the tendo achillis together and then the wound is carefully closed. The foot is dressed in an overcorrected position, so that the angle between the foot and the leg is less than a right angle (Fig. 329, 4). Then a plaster-of-Paris cast is applied and a window left for dressing. The cast is left in place for a period of three months. At the end of that time it is removed during the daytime and reapplied at night. The use of massage is instituted as soon as the cast is removed.

The history also states that the child has fully recovered from the slight paralysis of the left arm which he had after the recovery from the acute symptoms of his infantile paralysis or anterior poliomyelitis. This would indicate that we can hope for further improvement of the muscles of the leg to quite a marked extent, so that the ultimate result will probably be very satisfactory.

VARICOSE VEINS OF THE LEG

Summary: Six cases. Treatment by a combination of the Unna paste boot with operation by excision, by the Mayo vein stripper, and the Schede operation; the Nussbaum incision and Thiersch grafts for ulcer.

CASE I

History.—The patient, a married woman of fifty-eight years, was admitted to the hospital September 29, 1916, because of a cystic colloid adenoma of the thyroid and varicose veins of both legs.

Her family history is negative. Her past history is negative. She has had 8 children, 4 of whom are living. She passed through the menopause at the age of forty-eight years.

She has had large veins and recurrent ulcers of both legs since ten years ago. For the past two months there has been a large open sore on the right ankle, which has progressively become larger. There is much itching. She has had a goiter since she came to America twenty-six years ago, and it has grown slowly ever since. She has no symptoms attributable to the goiter. There is no abdominal or pelvic trouble.

Physical Examination.—The patient is a well-developed and moderately obese elderly woman with a good color. The upper teeth are missing and there is a moderate pyorrhea of the lower jaw. There is a large single tumor in the region of the isthmus of the thyroid gland, which is nearly spheric and about 8 cm. in diameter. It fluctuates and is very tense. There is no bruit and no other signs of hyperthyroidism. The heart, lungs, breasts, and abdomen are negative. There are large varicose veins in both lower legs with numerous scars of former ulcers and hemorrhages. On the inner aspect of the right ankle is a large indurated varicose ulcer 5 cm. in diameter.

Comments and Operation.—DR. OCHSNER (October 9, 1916): This patient had a large goiter removed last Wednesday. I would not take out the varicose veins then because I was afraid

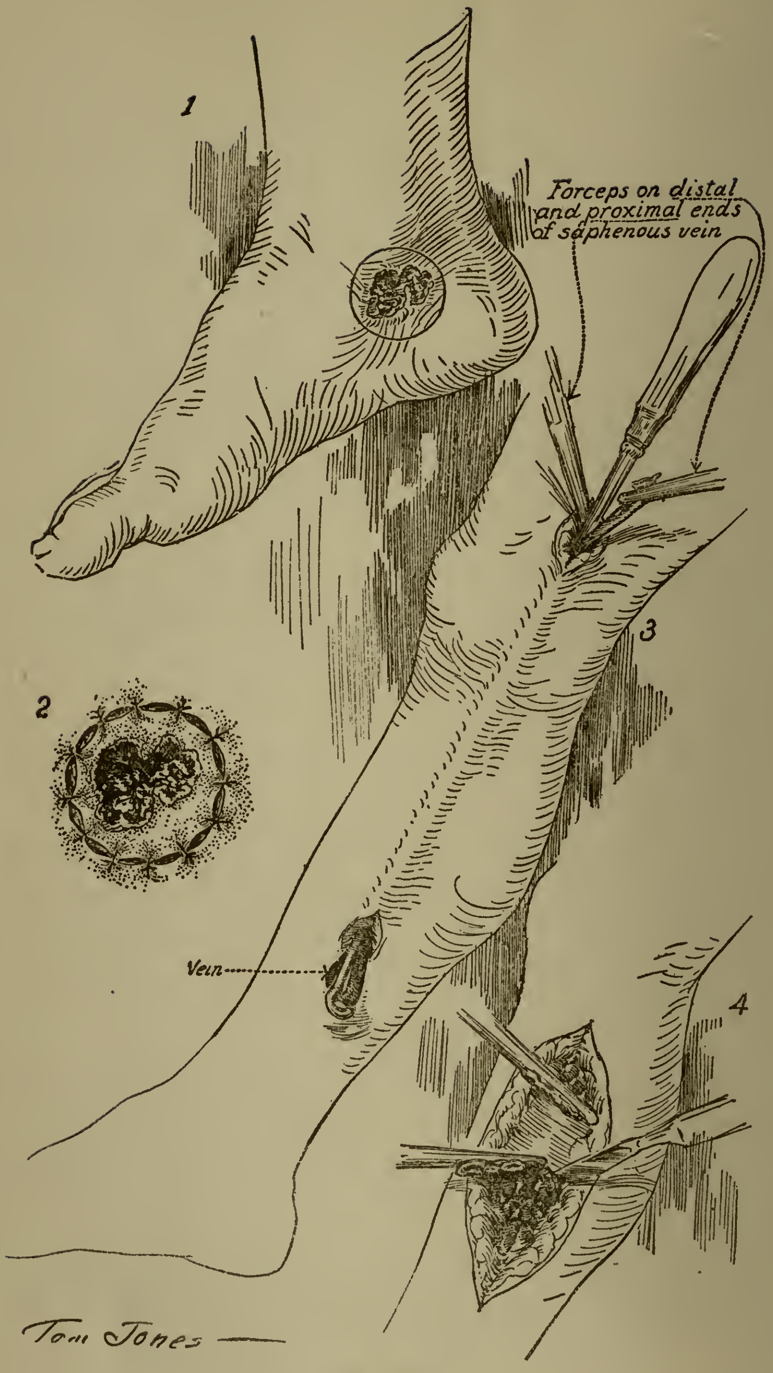
1
Forceps on distal and proximal ends of saphenous vein
2
3
Vein
4
Tom Jones

Fig. 330.

it might be too much for her, so I left the veins in place. Now we will remove them.

The patient has been anesthetized and the assistant is holding the entire right leg at right angles with the plane of the table in order to drain the blood out of the veins. A towel is now wrapped around the upper thigh and this heavy rubber tubing wrapped tightly about the leg over the towel. This serves the purpose of an Esmarch constrictor and effectively shuts off the circulation of the leg, both arterial and venous. It will not be removed until the operation is completed and dressings applied.

Now for this ulcer below we will make a Nussbaum operation. She has an ulcer on the inner side of the right foot, and in order to control the venous supply I shall make this incision about 2 cm. away from the margin of the ulcer (Fig. 330, 1). The object of this is to control all of the superficial veins so as to prevent venous stasis in the future. The difficulty in these cases lies in the fact that these superficial veins have had their valves destroyed. We grasp these veins by means of hemostatic forceps and ligate them with fine catgut which maintains the field perfectly dry. In the second place, we do not wish this patient to lose any blood because she has been weakened considerably by her goiter operation. The local condition, however, is so uncomfortable that we have decided to remove these veins while she is in the hospital. I am extremely careful in this portion of the Nussbaum operation not to make traction upon the skin-flap which is mobilized by this circular incision about the ulcer, because I wish to preserve it in as nearly a perfect condition as possible. This first circular incision is now closed with interrupted sutures of horsehair (Fig. 330, 2).

We now make an incision directly over the long saphenous vein at a point 6 cm. above the knee-joint. There we have exposed the vein, and we now bring it out between two pairs of

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Fig. 330.—Case I. Showing the method of treating a case of varicose veins of the leg complicated by a varicose ulcer: 1, Nussbaum operation, showing incision around the ulcer. 2, Details of suture of the same incision. 3, Method of using the Mayo vein stripper for the long saphenous vein. 4, Excision of a mass of varicose veins *en bloc*.

hemostatic forceps, cut it, and thread this distal end through the eye of the instrument which Dr. Charles Mayo invented for the management of these cases—the Mayo vein stripper. By this means we are enabled to dissect out this vein without the necessity of carrying our incision down its entire length (Fig. 330, 3). We carefully push the instrument along and find that we can dissect out the vein down past the middle of the leg. This seems to account for most of the varicosities on the medial aspect of the limb.

On the anterior surface of the leg I find that the veins have so many branches and are so irregular in their structure that it is necessary to lay open the skin for a distance of about 20 cm. in order to remove the most troublesome of the veins (Fig. 330, 4). In order to prevent an accumulation of fluid underneath these flaps I am making several small buttonhole incisions extending through the skin, which will prevent serum from accumulating and will let it pass out into the dressings. We ligate all the veins that we have severed. The blood from these skin areas will be carried back to the heart through the deep veins, the superficial veins having been excised. It is the backing up of the blood in the superficial veins which has caused the formation of the ulcer, which will now undoubtedly heal within a week. In order to make sure that all the superficial veins have been severed I add to the operation which I have completed so far a spiral incision partly encircling the leg. I am careful to leave between the spirals a strip of skin at least 3 cm. in width in order to prevent troublesome cicatricial contraction later on. As I come upon the veins they are grasped between two forceps and ligated. Ordinarily we do not fear for the smaller veins, but in this case, as I said before, I am trying to provide against the loss of even the smallest amount of blood. Consequently, I take this precaution. This operation is known as the Schede operation, because it was introduced some twenty-five years ago by Professor Max Schede of Hamburg, later Professor of Surgery in the University of Bonn. Anteriorly you see I have left a bridge of skin 3 cm. long, and am leaving a smaller strip posteriorly. In this way I guard against cicatricial contraction, which might interfere with the comfort of the patient. All the superficial veins of the entire leg have now been severed. All the incisions will be sutured carefully and a snug bandage applied. The legs will be placed in an elevated position at an angle of about 45 degrees, so that the return circulation will be aided constantly by gravity until the wounds have healed.

After the wounds have healed, in about two weeks, we will apply to the extremity an Unna paste cast. This is made by painting upon the surface of the extremity a mixture known as Unna's paste, made as follows: 10 parts of distilled water is heated over a water-bath in which is dissolved 4 parts of best grade of sheet gelatin. When this gelatin has dissolved, we add 10 parts of glycerin, and while the mixture is still hot, 4 parts of zinc oxid. Fine gauze bandages 5 cm. in width are used for the construction of this cast. The surface of the skin is covered by means of a brush with the paste which has been heated over the ordinary water-bath, then a layer of bandage is applied, then more of the paste, and then more bandage, and this is continued until we have four or five layers of gauze and paint. Finally the entire surface is covered with a narrow bandage about 3 cm. in width. The cast remains soft but firm, and is much more satisfactory than an elastic bandage. Such a dressing can be left on for from six to fourteen weeks, depending on weather conditions. During hot weather the paste tends to become somewhat soft and the bandages loosen sooner than when the temperature is lower.

CASE II

I shall now show several cases of varicose veins and varicose ulcers that have been treated and are still in the hospital. The next case is one which has almost precisely the same condition as the previous one. She is a married woman, a Russian, thirty years of age, with negative past and family histories. She has had 6 children all of whom are living.

Present Complaint.—After the birth of her first child twelve years ago she began to develop irregular swellings on the inside of the left leg. These did not bother her until about three years ago, when they began to itch and she scratched them. A sore developed which bled at times. She consulted a physician, who treated her at a hospital with different lotions for a period of five weeks. Since then she has been at home under medical care, but the leg has steadily become worse. She stayed in bed most of the time. About a week ago the left leg became very much worse and she had a generalized swelling of the entire leg up to the middle of the thigh.

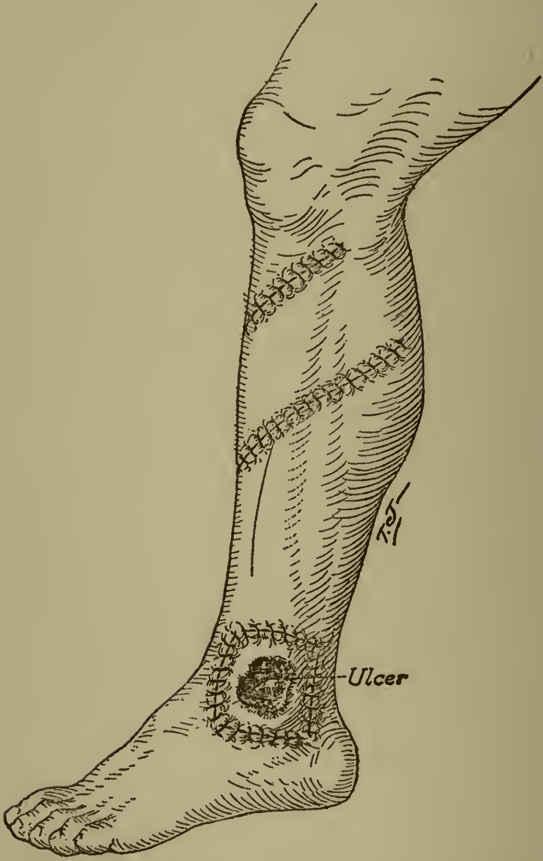

Fig. 331.—Case II. A case that has been treated by a combined Nussbaum-Schede-Mayo operation: External aspect of leg showing incision about the ulcer (Nussbaum) and two oblique Schede incisions.

Physical Examination.—Negative, except with regard to the left leg. Here there was a large, edematous swelling with irregular tortuous veins showing beneath the skin, especially over

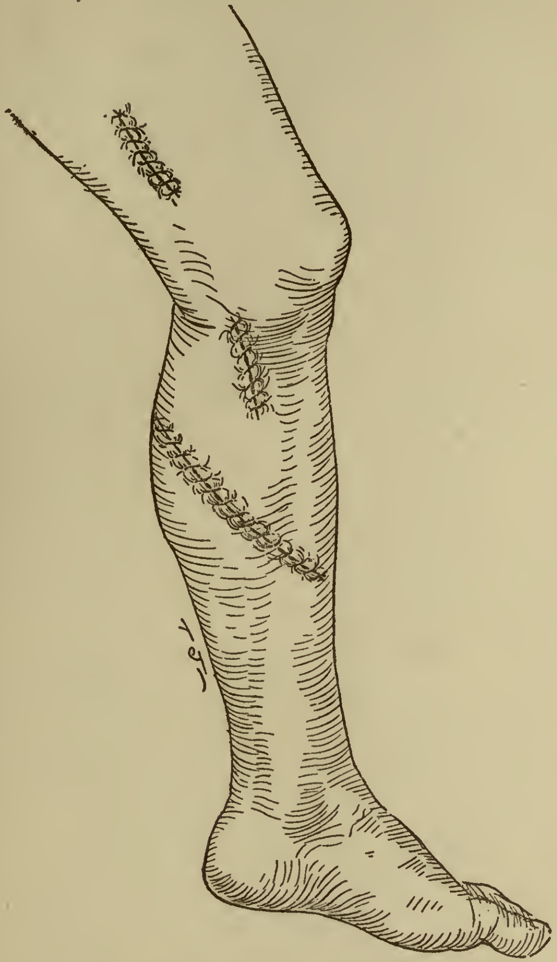

Fig. 332.—Case II. A case that has been treated by a combined Nussbaum-Schede-Mayo operation. Internal aspect showing a third Schede incision and the small wounds through which the saphenous vein has been removed.

the inner aspect, and extending from the dorsum of the foot to the upper end of the saphenous vein. There were several brownish blotches over some of these nodular areas, indicative of former ulcerations and hemorrhages. On the external surface of the ankle was an irregular, round ulcer 3 cm. in diameter, with ragged, somewhat rolled edges and a dull gray base, upon which was a seropurulent discharge.

Comments.—Dr. Ochsner: This case has been treated in practically the same manner as the case you just saw, except that a square incision was made about the ulcer instead of the round Nussbaum operation (Fig. 331). You will also note that the corners of the incision do not meet, but that there is a bridge of skin 5mm. long at each corner. The object of this is to prevent cicatricial contraction of the scar *in toto*. You will also note the two small incisions, one above and one below the knee (Fig. 332), where the long saphenous vein was removed with the Mayo vein dissector. Two lateral and one medial Schede incisions are also evident. This case was operated upon two weeks ago and the dressings have not been removed until today, when she is brought up to have the stitches removed. You will note the ulcer has a much more healthy appearance, with granulations at the bottom, and that all the incisions are well healed. One week from today an Unna paste cast will be applied in the manner already described.

CASE III

This case is a woman forty-seven years of age, married, in whose family there is a distinct history of tuberculosis. She had pneumonia thirty years ago. In 1901 a tumor mass was removed from the right jaw.

She has always done her own work and has been forced to be on her feet for many hours each day. She thinks that her three pregnancies had nothing to do with the varicose veins now present. She states that her mother had varicose veins of both legs. Four years ago she first noticed a blue line beneath the skin on the internal surface of the left leg running from the ankle to the knee. At that time the leg became swollen and ached a great deal. One year previous to admission to the hospital the patient struck her leg against an iron bed and rubbed off the skin over a small area above the internal malleolus of the left

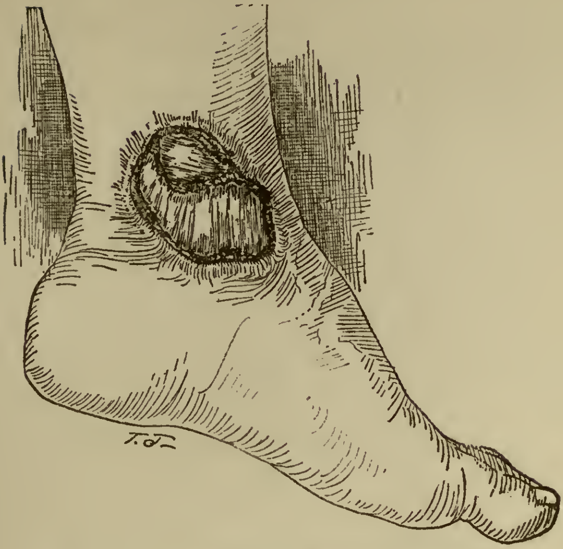

Fig. 333.—Case III. The skin-grafts applied.

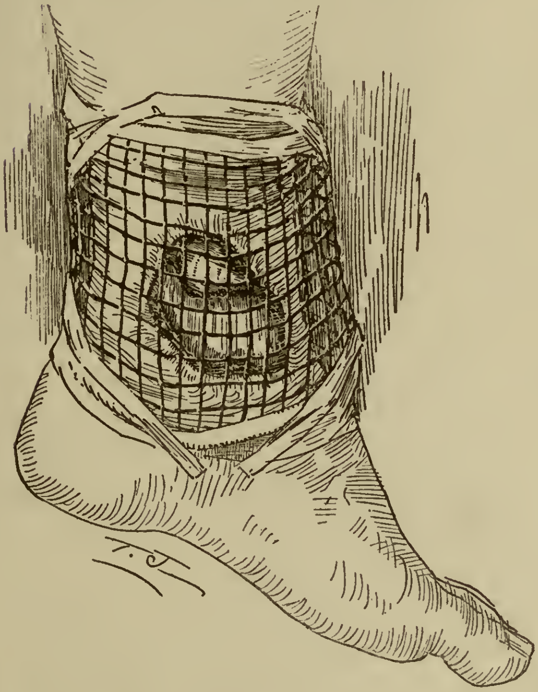

Fig. 334.—Case III. A wire screen applied to protect the grafts.

leg. This abraded area did not heal and a varicose ulcer developed, which has been present ever since.

Comments.—Dr. Ochsner: In this case the veins were not enlarged to a sufficient extent, nor were many of the valves destroyed. She was treated by elevating the leg upon pillows at an angle of 45 degrees and applying moist, warm boric acid dressings for a period of two weeks, after which she presented a clean ulcer with a full protection of healthy granulation tissue. Ten

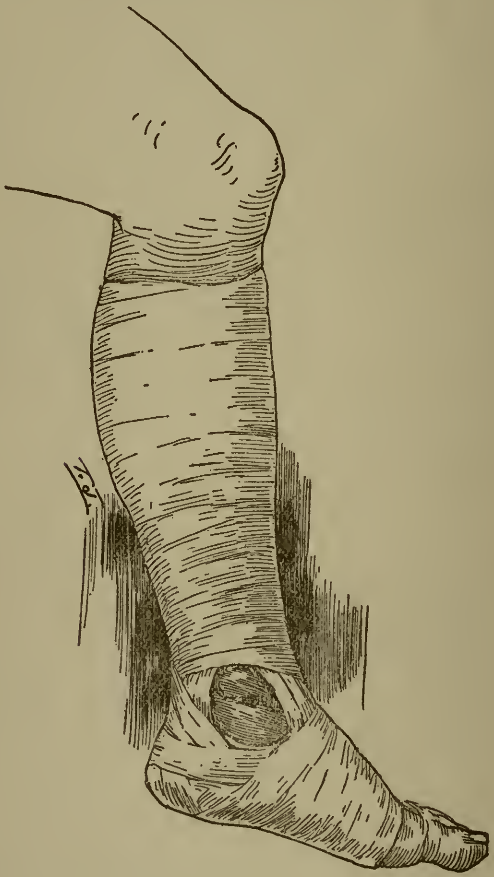

Fig. 335.—Case III. Unna's paste cast involving the lower leg, but excluding the ulcer.

days ago we applied Thiersch skin-grafts to the ulcer (Fig. 333) and then placed a basket made of wire netting in order to protect the grafts and ulcer from the dressings (Fig. 334). The grafts were allowed to heal while exposed to the air. These grafts healed very rapidly, and yesterday we applied an Unna paste cast (Fig. 335), involving all the leg from the toes to a point 2 cm. below the knee, except that part which had been covered with the skin-grafts. The reason we allowed the skin-grafts to be left uncovered was that this new-formed skin is very tender and cannot withstand the maceration incident to inclusion in a cast. Now she is ready to go home and there is no danger of the ulcer recurring because of the fact that the varicose veins are being well supported by the Unna paste dressing.

CASE IV

This patient, a Russian male aged forty-six, by occupation a storekeeper, is in for his second Unna's paste cast. His history is as follows:

For five years he had had enlarged veins on the left leg, which caused him little annoyance until about two years ago, when they began to swell and pain, especially toward the end of the day's work. On the advice of a physician he wore a tight bandage for a year, which then caused the upper leg to swell. About a year ago he removed the bandage and since that time he has had cramps in the leg, which have been so severe at times as to cause him to go to bed for several days. He would never have any pain at night if he elevated the leg upon pillows.

He was admitted to the hospital in the morning and the leg was immediately elevated and kept elevated throughout that day and night. The next morning an Unna paste cast was applied in the usual manner. Six hours later he was allowed to leave the hospital. This morning, eight weeks after the application of the first cast, a second cast will be applied after removing the old one and cleansing the leg thoroughly. He has experienced no pain, cramps, or swelling during the past two months, and it is our opinion that this second cast will be the last one he will need.

The length of time that these casts remain in place depends largely on the weather conditions. In winter or during cool weather a cast will remain in good condition from six to fourteen weeks. Excessive heat, however, causes the gelatin in the mixture to soften, thereby allowing the bandages to loosen. In such cases the dressings must be applied at more frequent intervals.

CASE V

A woman, aged fifty-one, who had what was termed "typhoid-malaria" at the age of thirty years. She has borne 2 children, who are now thirty and twenty-six years of age respectively. Menopause occurred one year ago. When the patient was a young girl her right knee-cap would occasionally slip out of place to one side, and she would fall and have a great deal of pain. Ever since that time she has worn a knee bandage in order to hold the knee-cap in place. About ten years ago she began to be troubled with a swelling of the legs just above the ankles. On the advice of her physician she wore rubber stockings, and has continued the use of these up to the present time. About three years ago the patient was troubled with hard, red, painful areas which would appear on the legs and last from two to three weeks, but without ulceration of the skin. The swelling and tight feeling has become worse since then. During the past year she has been almost unable to move her limbs in the morning upon arising. The pains at times extend from the toes to above the knees. She never has seen any veins. She has been severely constipated for the past three years.

Diagnosis.—Edema of the legs due to impaired venous circulation following the use of a constricting bandage about the knee.

Treatment.—Unna's paste cast to both legs.

CASE VI

A woman aged forty-one, a housewife, who had a hysterectomy performed two years ago. During the past twenty years she has been troubled occasionally with swelling of the veins of the left leg accompanied by pain. This swelling was always worse when she was pregnant. Six weeks ago the present attack began as a painful clump of enlarged veins about 5 inches below left knee. She states that she was hit at this place by a brick twenty-five years ago and that the spot has always been more or less tender. This area has pained her constantly for the past six weeks and the pain is increasing, especially on standing. She has noticed a swelling of both legs for the past few months, which is worse in hot weather. She becomes dyspneic on slight exertion, such as climbing stairs, but has no palpitation and no cough.

Treatment.—An anterior incision was made in the upper middle third of the left leg in an oblique direction, and the varicose veins, which had perforated, excised. The internal saphenous vein was stripped to a point half-way between the knee and the hip with a Mayo vein dissector and the proximal end ligated. Several smaller branches were followed to the ankle, cut, and ligated. Two Schede incisions over the calf of the leg were made and a number of small veins again cut and ligated.

This case remained in the hospital two weeks. The stitches were removed at that time. Four days later an Unna paste cast was applied and the patient went home on the following day.

POSTOPERATIVE TETANY OF STERNOCLEIDOMASTOID MUSCLE: TREATMENT BY TENOTOMY AND CALCIUM LACTATE INTERNALLY

Summary: Tetany of sternocleidomastoid following second operation on thyroid gland for hyperthyroidism; technic of tenotomy; medicinal treatment—calcium lactate and parathyroid tablets; other methods of treating parathyroid tetany—thyroid grafts—excision of cervical ganglia.

COMMENTS AND OPERATION

Dr. Ochsner (September 20, 1916): This patient suffered from hyperthyroidism, and for this condition a portion of the thyroid gland was removed. You can hardly see the line here. (Indicating the Kocher collar incision.) After this was removed he improved very much and remained very much better for a number of months. Then he came back with more hyperthyroidism and another portion of the gland was removed. Now he comes back with a certain degree of tetany, and the manner in which this condition troubles him most is in the contraction of the sternocleidomastoid muscle, particularly the sternal end of this muscle. Now after he is asleep you can see that this muscle is in a spasmodic condition. You can see these portions of the muscle standing out, and so, in order to relieve this condition, I am going to sever the sternal attachment of the sternocleidomastoid muscle. I am making an incision through the line of the former incision (Fig. 336, 1) and I am reflecting the skin downward so as to expose this lower attachment of the sternocleidomastoid muscle. Now I sever the attachment below so that there is nothing left against which this part of the sternocleidomastoid muscle can pull (Fig. 336, 2). The operation is the exact operation that Mr. Robert Jones of Liverpool uses in relieving torticollis, which is due to an actual shortening of the sternocleidomastoid.

I am exceedingly careful to control the hemorrhage as I proceed step by step, because I wish to keep the field entirely

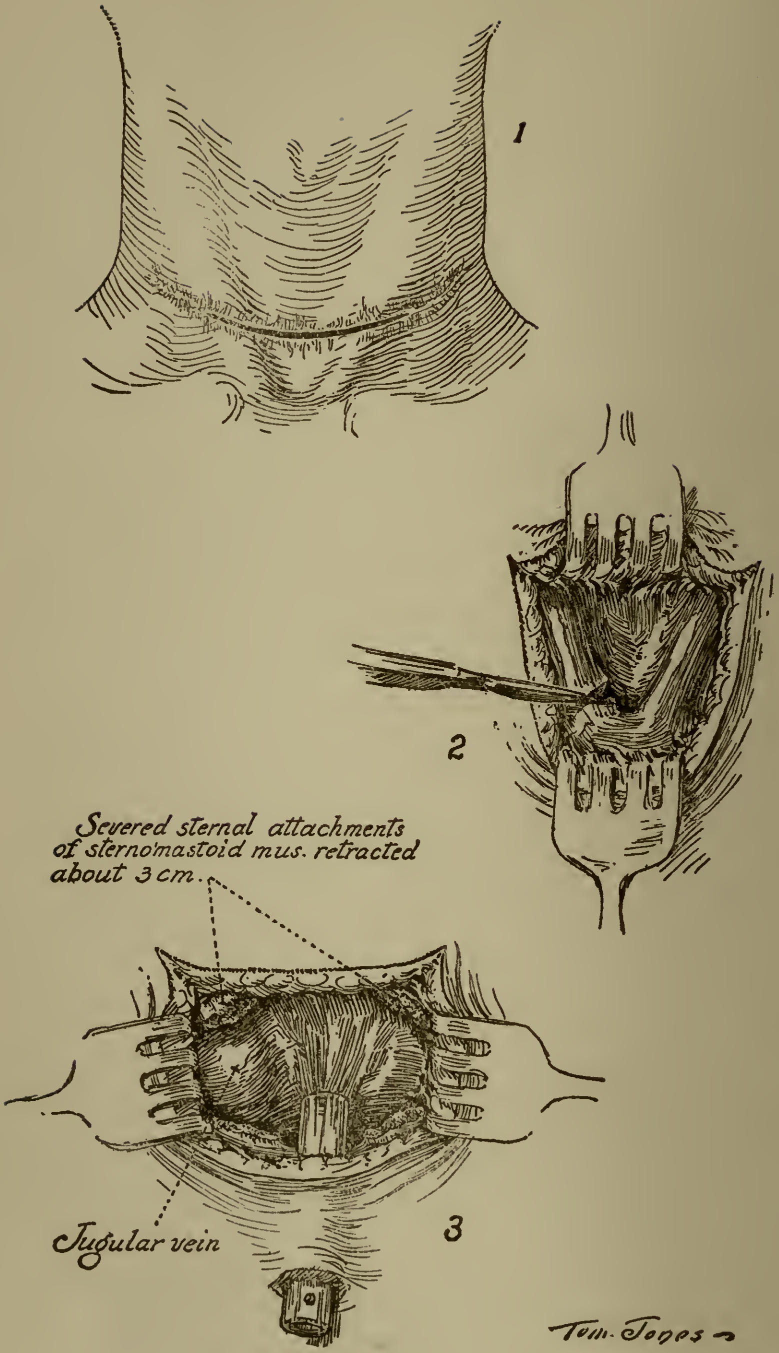
1
2
Severed sternal attachments of sterno'mastoid mus. retracted about 3 cm.
Jugular vein
3
Tom. Jones

Fig. 336.

free, so that I can see clearly what I am doing. You see the muscle contracts immediately a distance of 3 cm., which I think will be quite sufficient to give him permanent relief (Fig. 336, 3). Just on the inside of the edge of this muscle you see this bulging, which is due to the dilatation of the deep jugular vein, which is located posterior to the sternocleidomastoid muscle, and now that the muscle has contracted the vessel bulges.

The anesthesia is the one we use when we operate for removal of the thyroid gland. The patient received $\frac{1}{4}$ grain of morphin and $\frac{1}{100}$ grain of atropin one-half hour before the anesthetic was begun, and now with the head elevated we have the patient fully under the control of the anesthetic throughout the operation.

We will make a little opening at the site of the original drainage opening and a little glass Kocher drainage-tube will be put into this space so as to prevent an accumulation of blood. Then we control the hemorrhage perfectly by ligating the vessels of the skin-flaps and close the wound in the skin by horsehair sutures.

The patient will be given 15 grains of calcium lactate an hour before and after each meal and at bedtime, so that he will have during twenty-four hours a little over 100 grains of calcium lactate. I believe that will be sufficient to relieve the spasm of the muscles, and the absence of the spasm will overcome his nervous condition. It was the fact that these muscles would suddenly become tense and would make him so nervous that he felt that his old trouble was coming back. We will also give this patient some parathyroid tablets—$\frac{1}{4}$ grain four times a day. I have had a number of cases in which the calcium lactate seemed to have a specific effect in overcoming the contraction of the muscle, so that in these cases the tetany disappeared entirely, except in one case, in which we had to remove the cervical ganglion from which branches supply the sternocleidomastoid and the scalenus muscles. In the other case the tetany seemed to be

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Fig. 336.—1, Incision made through scar from the two previous operations. 2, Sternal attachments of the sternocleidomastoid muscle being severed. 3, Retracted ends of the muscle and a glass tube drain in position just before closure of the wound.

the result of an injury to the lower parathyroid. In each case there was a secondary operation; that is, a primary operation for the removal of a portion of the gland and a secondary operation for the same purpose, but which in addition had interfered with the parathyroid, either by direct injury or by cicatricial contraction. This patient has had two operations. He has had portions of the thyroid gland removed twice. Now two years later he comes with this slight form of tetany. In one case in which there was tetany it had resulted from an infection. She had a severe infection from her tonsils, and this infection apparently extended to the parathyroid gland, and she had quite a marked tetany. In this case we grafted one lobe of the thyroid gland, which we removed from another patient, into the neck. That grew nicely at first and the patient was relieved of the tetany for a year. Then that seemed to absorb and the tetany recurred. We removed the cervical ganglion two years ago, which seems to have kept the tetany from returning until the present time. Whether it will recur or not, of course, we cannot tell.

CLINIC OF DR. JOHN RIDLON

MERCY HOSPITAL

HIP DISEASE

Summary: Fourteen cases illustrating the salient clinical features of hip disease and some of the difficulties in the differentiation of tuberculosis of the hip from other pathologic conditions.

May 21, 1917.

I AM able to show you today only 2 patients with three diseased hips. Fortunately, they are borderland cases and warrant a discussion of the subject of hip disease from many sides.

At one time the term "hip disease" was used to cover about all diseased conditions at the hip-joint. Then osteomyelitis was differentiated; then osteoarthritis, and finally osteochondritis—Perthes' disease—from tuberculosis of the joint, as hip disease had come to be accepted pathologically. Now the diagnostic pendulum seems to be swinging back from that which is pathologically often uncertain to that which is clinically certain, namely, that the hip is diseased—hip disease.

Here are two brothers, the only children of healthy parents. The older was nine years of age when he came to me January 17, 1916. He had been walking lame for about two months. Little complaint of pain and no night cries. He had always been a healthy child except for an abscess under the left ear which discharged from his second to his sixth year, and left a deep scar, He was, when first seen by me, as he is now, a healthy looking boy.

Examination showed the left leg $\frac{1}{4}$ inch shorter and $\frac{1}{4}$ inch smaller as to calf and thigh than the other. The limb was held somewhat adducted; abduction and rotation were restricted; flexion was almost normal; hyperextension was restricted.

The radiogram of the two hips showed the left femoral head somewhat smaller than the right, with, possibly, a detached piece on its articular surface $\frac{1}{2}$ to $\frac{3}{4}$ inch long (Fig. 337).

The diagnosis of osteochondritis was made; and a short plaster spica put on. He was allowed to walk on the leg in moderation, and without crutches. This treatment was continued up to January 29, 1917, when the cast was removed. Now after about four months you see that he walks and runs with scarcely any limping and no evidence of pain or sensitiveness, and that he has about half the normal range of motion at the hip-joint in all directions. But the radiogram today shows that a very serious amount of destruction has taken place in the head of the femur (Fig. 338).

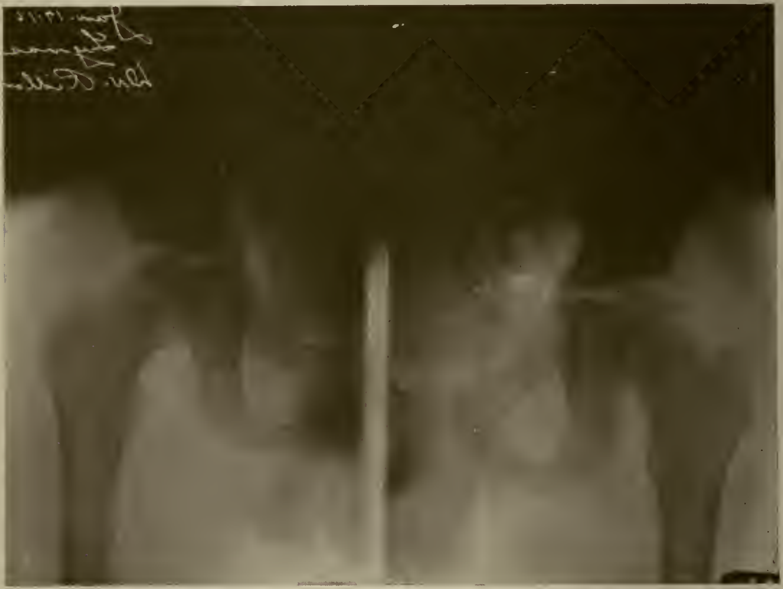

Fig. 337.—Case I.

The younger brother, aged seven years, was brought to me on January 29, 1917. He was the first to go lame, namely, some eight months earlier. He was treated first by the general practitioner who had charge of the case with an "ambulatory splint" for about nine months. Then an anesthetic was administered and a plaster cast put on with the thigh (left) flexed about 45 degrees and the knee flexed on the thigh to about the same extent. When I first examined the patient there was practically no motion in any direction at the hip-joint, and measurements as to the length of the limbs was unsatisfactory because of the flexion deformity. The radiogram of the two hips shows little difference (Fig. 339). By prolonged gentle manual traction the limb was straightened about one-half and a short plaster spica applied.

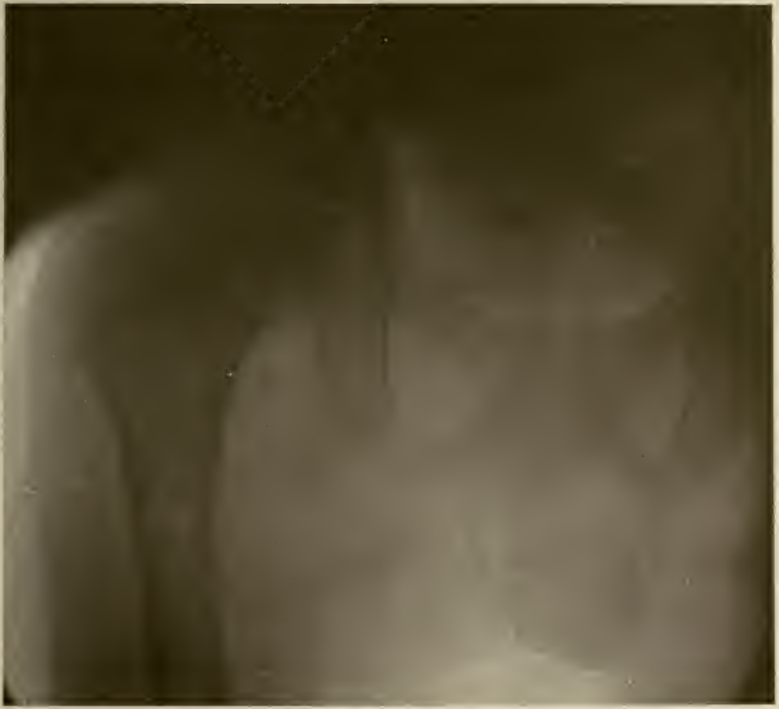

Fig. 338.—Case I.

By the end of two months the flexion deformity had been corrected, and there was some motion in flexion on gentle manipulation. From this on the range of motion steadily increased. At the end of six months he came walking on the toe of the right foot with the thigh held flexed and adducted. Motion in abduction and hyperextension was not possible, and rotation was greatly restricted.

From this on the boy was treated by a double plaster spica, and, of course, was unable to walk without crutches. After eight months the cast was removed from the left (first) hip, but has been continued on the right (second) hip. He has, as you see, about as good a range of motion in the left hip as his older brother.

Are these cases of Perthes' disease—osteochondritis—or are they mild hip disease (whatever that may mean), or are they tubercular, or what? Frankly, I do not know. Let us call them cases of hip disease.

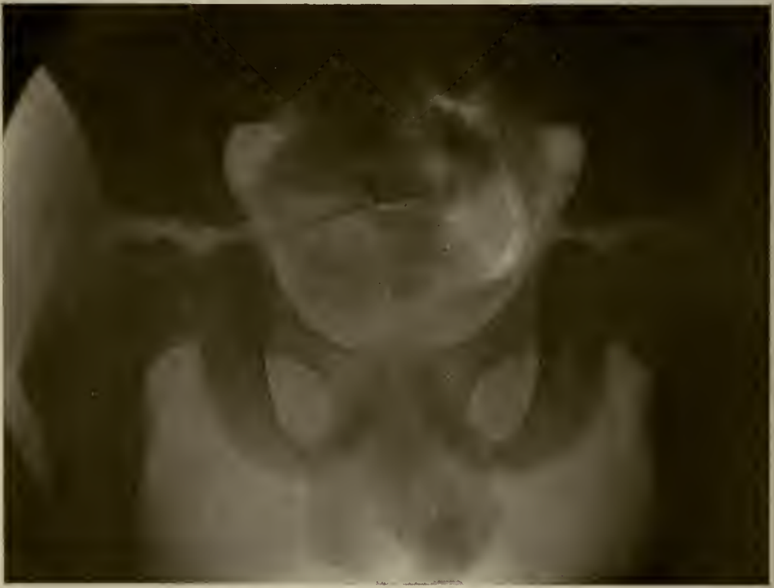

Fig. 339.—Case II.

In any event, the treatment should be the same: To prevent the development of deformity; to correct any deformity that may have developed; to protect the joints as long as they are sensitive, and to allow use in walking long before the immobilizing plaster cast or splint is discarded.

It may be of interest to compare this second case, the boy with disease at both hips, with another double hip disease case, one frankly tuberculous.

Case III.—On July 31, 1909, a boy three and a half years old, of healthy parents, was brought to me for disease of the right hip. About six months earlier he complained of pain in his thigh, which passed away after about a week. A month to six weeks later it returned and has remained more or less constant. For six weeks he has cried out in his sleep. Has limped for about four months. There was noticeable muscular spasm, and slight restriction to motion in all directions at the hip-joint. The thigh was $\frac{3}{8}$ inch smaller than the left, but the calves measured the same, and there was no shortening.

Treatment was by the long (Ridlon) traction splint (Fig. 340). After three months swelling was noted in the groin as from an abscess. After some months this swelling disappeared.

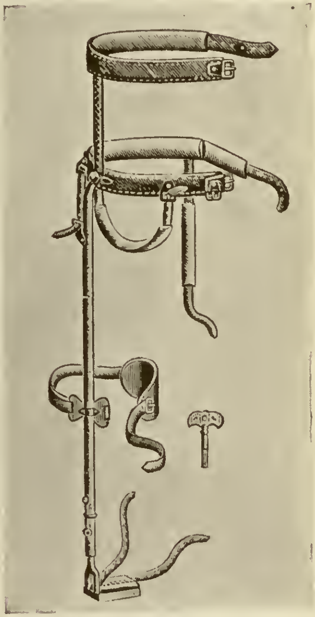

Fig. 340.—The Ridlon long traction hip-splint.

Two years later he began to complain occasionally of pain in the other hip, but nothing was found on examination. After about nine months the pain became persistent and there were night cries. Muscular spasm and limitation of motion in all directions were present. The traction splint was discarded and a double Thomas hip-splint applied, and walking forbidden. This was in April, 1912. By the end of December, 1913, the boy was getting beyond control and crawled about and stood by himself. One day while being taken from his carriage he complained of the left knee, and it soon became swollen. Knee-joint disease was suspected, but a radiogram showed a fracture $2\frac{1}{2}$ inches above the knee-joint.

A radiogram of the hip-joints at that time showed the right hip apparently well, but the left hip doubtful. Treatment of the right hip was discontinued; the left hip and the fractured femur were put up in a plaster splint from the toes to the nipples.

After two months he was allowed to walk. After three and a half months the fracture was found solidly united. Treatment of the left hip was continued with a plaster spica for another year, up to March, 1915, nearly six years from the beginning of treatment of the first hip. At some time during the period of treatment in the double Thomas hip-splint, the record does not state just when, a cold abscess developed on the left thigh, opened spontaneously, and, after discharging for several months, closed.

The final result is that the right (first) hip, which had only a little motion when treatment of it was discontinued, now has practically normal motion, and in the radiogram shows small evidence of having been diseased; while the left hip has only about one-third normal motion and, despite the abscess, shows less destruction of bone than is shown in the hip of Case I, that had no pain, no night cries, and no abscess. It has been now two years since treatment was discontinued.

Quite a different result is shown in Case IV. A boy, seven years old, of healthy parentage, was brought to me June 14, 1906. He had "dragged" his right leg for two years. The attack came suddenly at night, the boy crying out and holding his knee drawn up.

Examination showed the boy walking with a limp. Legs same length; calf $\frac{1}{8}$ inch and thigh $\frac{3}{8}$ inch smaller. Motion in flexion and inward rotation restricted, but other motions nearly normal. A month later the limb was held adducted and rotated inward, and motion in all directions was greatly restricted.

For five years he was treated with the long traction splint. He never had pain or sensitiveness, but adduction deformity with false shortening steadily developed. Then the limb was stretched during anesthesia and put in a plaster spica for six or eight months. Treatment was discontinued six years after starting.

A year and a half later, at the end of 1913, he still appeared to be well, with a practical and a real shortening of $1\frac{3}{4}$ inches. Two years later the real shortening had become $2\frac{1}{2}$

inches and the practical shortening 3½ inches. Since then he has developed pulmonary tuberculosis.

The radiogram of the hip shows an enormously eroded and enlarged acetabulum with the femoral head gone, or at least eroded to the size of the femoral neck (Fig. 341). This boy has practically no motion at the hip-joint, while other cases appearing identical in the radiogram may have practically normal motion.

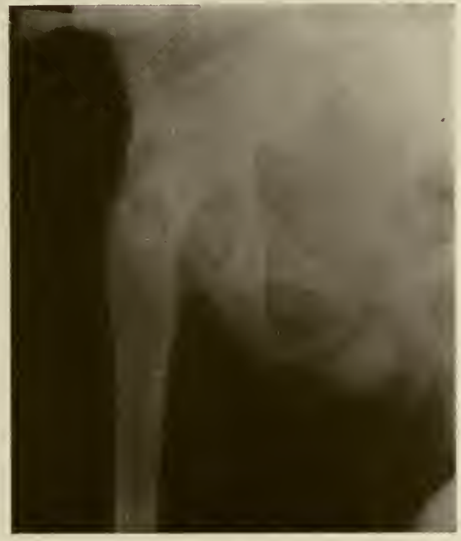

Fig. 341.—Case IV.

Case V.—Note the radiogram (Fig. 342). Apparently a complete ankylosis. The patient was a girl of thirteen years, who had had pain and some limping off and on for two years. the affected leg was ½ inch short; the thigh 1 inch and the calf ¼ inch smaller. About half the normal range of motion was present in all directions. Treatment was by a plaster spica for two years. Two years after treatment had been discontinued the limb was no shorter (½ inch) than at the beginning, and the range of motion was fully one-third the normal in all directions. It was at that time that this radiogram was made.

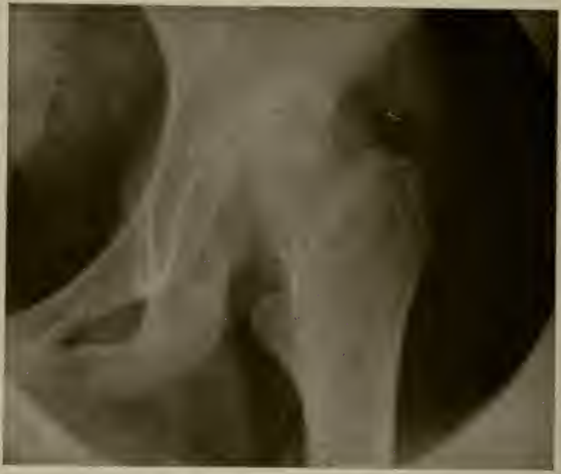

Fig. 342.—Case V.

Case VI.—The radiogram of this case shows the typical result after recovery from Perthes' disease; but when I treated him from 1911 to 1913 I believed the case to be one of tuberculosis of the hip following an injury sustained eight months before (Fig. 343).

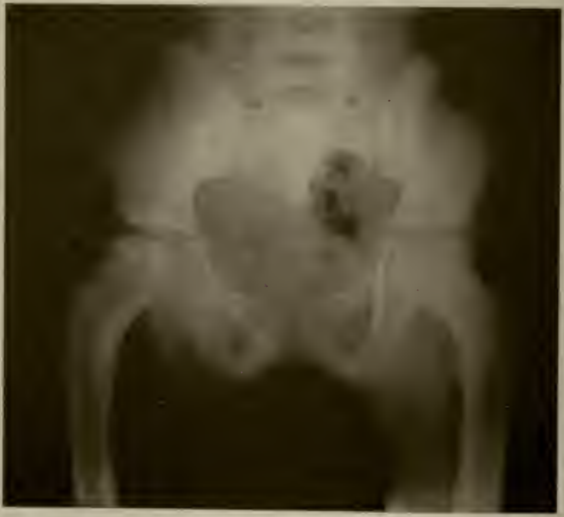

Fig. 343.—Case VI. Healed osteochondritis; note flattening of femoral head on affected side.

Case VII.—A boy eleven years old fell and hurt his hip. He limped and complained. I examined him after two weeks in bed and found no definite cause for his symptoms. He was kept in bed about two months. Eight months after the first attack he developed typical pain, limp, and restriction to motion in all directions. The calf was $\frac{1}{4}$ inch and the thigh $\frac{5}{8}$ inch smaller, but there was no shortening.

The radiogram "suggested disease of the acetabulum." He was treated for eighteen months with the long traction hip-splint. He recovered with a perfect range of motion, and the radiogram shows an apparently normal hip (Fig. 344). The case, when treatment was commenced, was more typically one of tuberculosis than any of those previously referred to.

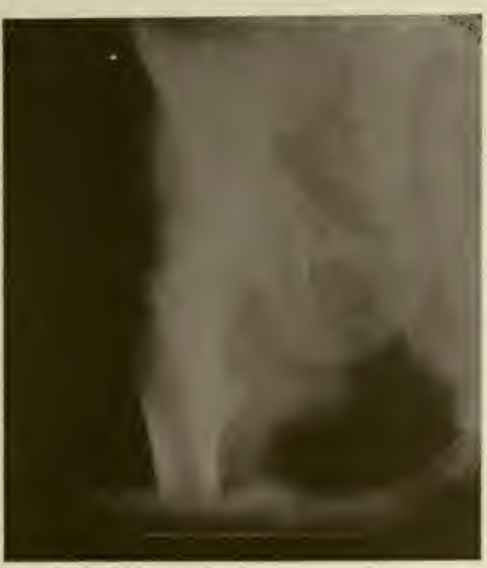

Fig. 344.—Case VII.

Case VIII illustrates another type of result which is found in hip disease. The boy was three years old when first seen. He walked with a limp and motion in all directions was restricted to some extent, and there was beginning hip disease. He was treated with a long traction splint for four years, at which time the disease appeared to be well, but the limb was left with both true and false shortening, somewhat flexed and markedly adducted, and with little motion. An anesthetic was then given, the leg stretched and abducted, and put in a plaster spica, which was removed from time to time, and worn for a year and a half. The radiogram shows the condition at the end of seven years' treatment (Fig. 345).

Case IX.—The radiogram of this patient is shown simply to illustrate the differential diagnosis of the osteo-arthritic hip from the other hips that have been shown (Fig. 346). Note the marked lipping, the periarticular osteophyte, the mushrooming of the femoral head, and the increased density rather than porosity of the involved parts. (Compare especially with Fig. 345.)

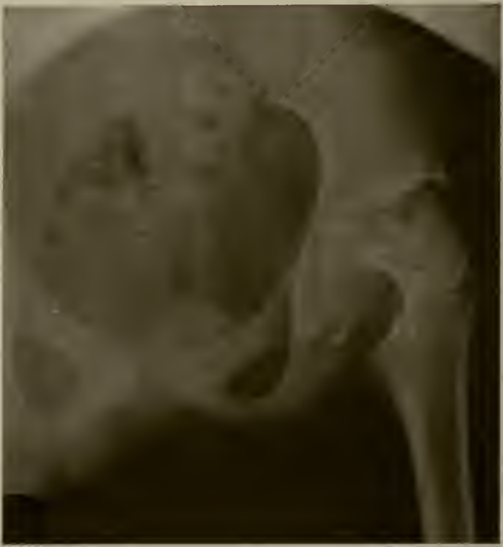

Fig. 345.—Case VIII. Note evidences of extensive destruction of head of femur and of acetabulum.

Case X should be a lesson to those who are impatient for a cure and to those who favor the use of any form of tuberculin in the treatment of tuberculous joint disease. A boy of four years, of healthy parentage, eight months after an attack of measles was found limping with slight flexion and adduction deformity, some sensitiveness, and with motion moderately restricted at the hip-joint. He was treated with a long traction hip-splint. At the end of two years he appeared to be well. There was motion in flexion beyond a right angle, good rotation, full abduction, and hyperextension. The parents believed the boy to be cured and treatment was discontinued.

Six months later the symptoms returned with some pain, more sensitiveness, and almost complete stiffness at the joint.

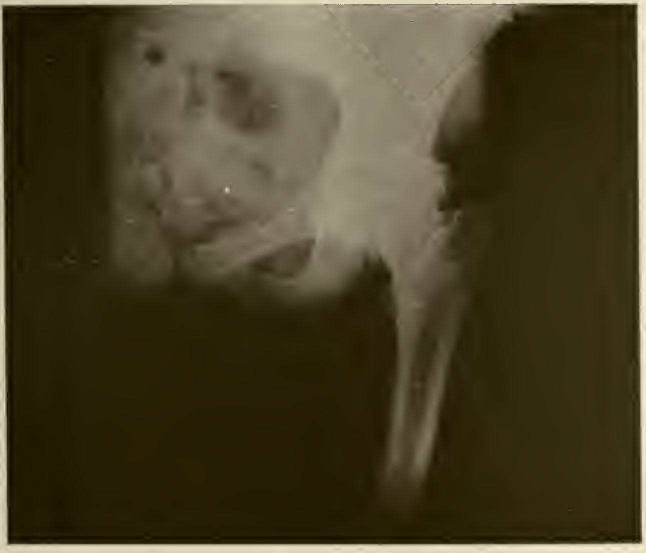

Fig. 346.—Case IX. Osteo-arthritis.

The treatment was resumed. Again, after some two years, he appeared to be well, with good range of motion. Again treatment was discontinued. Again symptoms returned, with considerable flexion, marked adduction deformity, and great stiffness at the joint; but there was no pain or sensitiveness. An anesthetic was given, the leg stretched into moderate abduction, and put in a plaster spica.

In this the boy went to school, played ball, and did all the things an active boy of his age would do. After some six months in the plaster spica the parents consulted an eminent surgeon, and on his assurances of a rapid cure submitted to six weekly injections of tuberculin, the plaster spica being continued. By the end of six weeks the boy was suffering constant pain in his leg, and it was so sensitive that he not only was confined to bed, but could not turn over in bed without help. At a change of the plaster spica an abscess the size of half an orange was found on his thigh. The tuberculin was discontinued, the plaster spica continued, and after four months he was once more able to get about and return to school. After a year more in the plaster spica, followed by the convalescent leather splint (Fig. 347), he was considered cured, and has remained so, but with an absolutely stiff joint (Fig. 348).

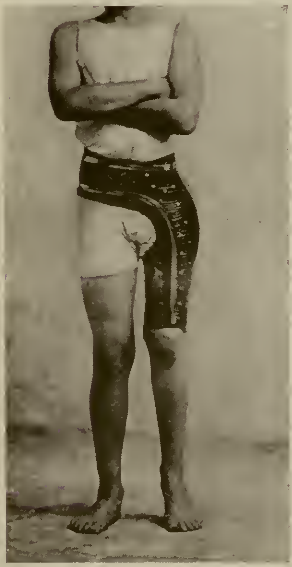

Fig. 347.—Case X, showing convalescent leather splint in place.

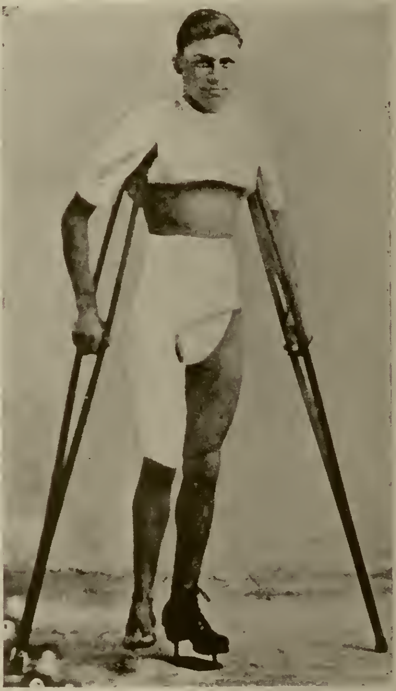

Fig. 348.—Illustrating short plaster spica and mode of locomotion on crutches and raised boot on sound leg preliminary to bearing weight on diseased hip.

Case XI illustrates a rather unusual condition. A boy was treated for hip disease by the late H. R. Allen, Sr., of Indianapolis, and pronounced cured when twelve years old. For twenty years he had no symptoms. Then at the age of thirty-two years the symptoms of the hip disease returned, and the radiogram revealed an encysted focus of disease in the ilium at the upper border of the acetabulum (Fig. 349).

Case XII illustrates some of the difficulty in the diagnosis of hip conditions. The girl was nine years old. The mother thought that there was some trouble just below the right hip because the child complained of the leg getting stiff. The record of my examination is as follows:

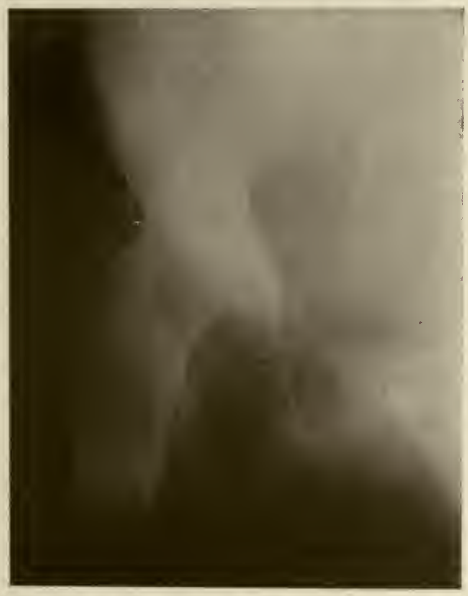

Fig. 349.—Case XI.

Lying on the face the spine is straight and flexible. There is no psoas contraction. On back the limbs measure the same and all joint motions are normal. She can sit on the table with knees straight and touch her toes. No sign of disease in spine or hips.

But the radiogram shows a beautiful example of beginning osteo-arthritis.

Case XIII was treated for many years in early life for hip disease, at first by one eminent general surgeon, and then by another, and later by a notorious orthopedist. For more than thirty-five years he has believed that he suffered from hip disease. He was brought to the hospital on a cot, with weight attached to his leg, from a town a hundred miles away. There were no clinical symptoms on examination except shortening.

The radiogram shows that there is a coxa vara that developed at the beginning of his trouble when he was an overgrown and hard-worked farmer boy of seventeen years (Fig. 350).

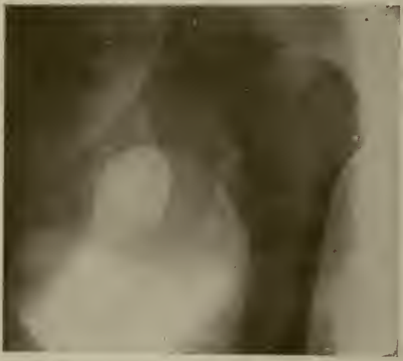

Fig. 350.—Case XIII.

Case XIV is a case that ought not to have been mistaken for hip disease, but was by the general practitioner, who referred the case to me. The woman was thirty-four years old. Two years before she had pains in her thighs, and was treated for rheumatism. She was left with some stiffness in both limbs. After a year swelling appeared in the left thigh, but she had no regular pain. At times there would be shooting pains here and there in the legs that would cause her to cry out. After the swelling appeared in the left thigh she took to the use of crutches, which she continues. Her husband has abandoned her; his character is not well defined, possibly irregular. Patient has had two miscarriages, no living children.

Examination.—Lies on the table with the left leg somewhat adducted and 2 inches short. All movements at the hip-joint are free, indeed, freer than on the other side, and painless. There is no muscular atrophy. There is a "crunching" feeling at the hip on rotating the limb.

Feeling to pin-prick delayed. Sways on standing with eyes closed. Knee-jerks absent. The radiograph shows apparently some remains of the femoral head in the acetabulum; all the rest of the femoral head and neck gone (Fig. 351). Diagnosis: Tabetic hip.

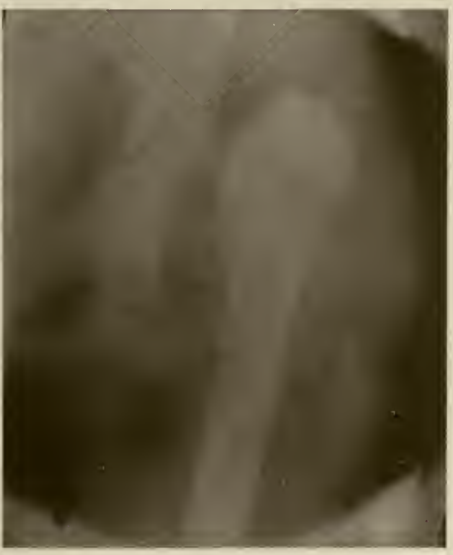

Fig. 351.—Case XIV.

The lesson that this clinic appears to teach is that the diagnosis of tuberculosis at the hip-joint is not always easy; that the prognosis in any individual case as to duration of the disease and ultimate result is impossible; that osteo-arthritis, particularly in children, does not always give a stiff hip, as we expect it to do in adults; and that a certain differentiation between Perthes' disease and tuberculosis of the hip is not always possible.

CLINIC OF DR. ALBERT E. HALSTEAD

St. Luke's Hospital

HEREDITARY DEFORMANS CHONDRAL DYSPLASIA

Summary: Case illustrating the clinical characteristics of the disease; pathology—a disturbance of the intermediary cartilages during the period of skeletal growth; cure unknown, but palliation usually possible; etiology still a manner of speculation.

HISTORY

Mrs. F., married, age twenty-eight, white, native of United States, for the past fifteen years has complained of swelling of the right side of face, jaw, frontal region of head, and of left arm near elbow; prominence of the eyes, with dimness of vision, headaches, dizziness, impairment of hearing on the right side, and pain and tenderness over left arm near elbow. About fifteen years ago she first noticed that the right side of the nose was becoming prominent. This increased in size and caused her no pain. In 1907 she had *x*-ray pictures taken and was operated upon, but on account of some difficulties with the anesthetic the operation was not completed, nor again attempted before she left the hospital. At this time she noticed that the lower jaw on the same side was increasing in size, and shortly after that a swelling appeared on the top of the head. There was never any pain associated with any of these growths. Five years ago her left arm began to pain her, beginning in the shoulder and extending down the whole arm. Soon after she noticed a swelling just above the elbow, which pained her and was tender to touch. Her arm became weaker and it has never regained its normal strength. It is still somewhat painful.

For several years her eyesight has been failing and her eyes have become prominent. During the last two months she has noticed that her hearing is impaired on the right side and that she has headaches, which have become more frequent in the last month. These headaches are generally over the vault and are not constant or regular in occurrence. The last two months she has had dizzy spells, especially when she stoops or turns suddenly. She has had some sore throat and dry cough.

She has had two children. One died at fourteen months. One is seventeen months old and is in good health. She nursed this baby until it was thirteen months old. She had one miscarriage at two months three years ago. She has not menstruated since the birth of the last baby. Her appetite is fair, bowels irregular, and she has lost about 10 pounds in weight during the last year.

Family History.—Mother and father are both dead, both deaths being due to pneumonia. She has four brothers and two sisters living and well, and none of these have any deformity. In her mother's family there were 7 children that were born dead.

PHYSICAL EXAMINATION

General.—The patient is a white adult female, age twenty-eight. She is poorly nourished and has the appearance of having had a recent illness.

Head.—At the junction of the *parietal suture* in the midline anteriorly a transverse, round, bony outgrowth is palpable. It is not tender. There are no other palpable bone growths on the skull. This growth is about the size of a small walnut.

Ears.—Appear normal. Hearing, however, is only fair by watch-tick. Less acute on the right side.

Eyes.—There is a moderate exophthalmos. The width of the palpebral fissure is increased. There is an external squint with an occasional diplopia. There is no increase in ocular tension. There is no loss of function of the eye muscles. The range of vision is fair by the finger-test. Pupils are unequal in size. Neither react to light; both react to accommodation. The conjunctivæ are negative.

Nose.—There is a bony outgrowth occupying the right lower aspect of the nose extending from the tip to the external nares. There is a similar growth on the left side extending from the root of the nose out, the thickness of a finger. No perforation of the septum is found. The septum is deflected to the right. The right nares is practically occluded. The left nares appears clear. On attempting to breathe *both nares are obstructed high up.*

Mouth.—Negative. The lower front teeth appear rather small and irregular in size. Tongue is negative. Attached to the inferior maxilla of the left side extending from the symphysis menti there is a bony growth which is round and slightly roughened. It is firm and tender on palpation. It is about the size of a small orange. On the right inferior maxilla, beginning at the symphysis and extending along its entire course, there is a bony growth. This growth is hard and not tender and rather irregular in contour, and is about 6.5 cm. in width at the angle. The right side of the face is considerably distorted (Figs. 352–354).

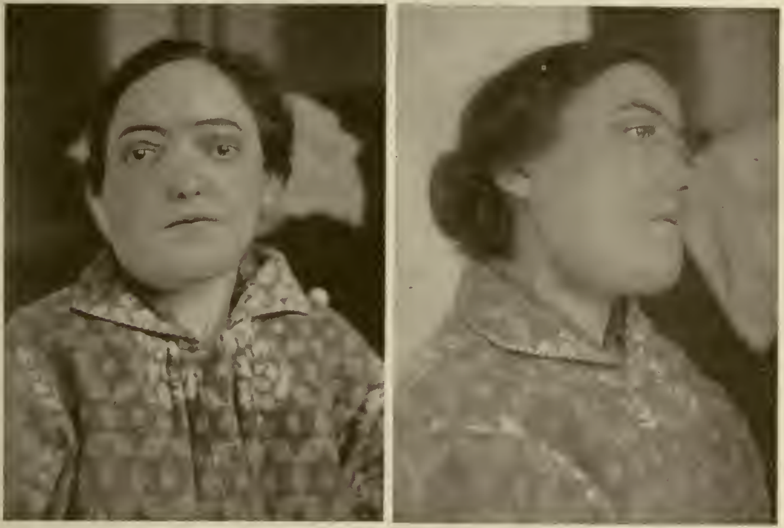

Fig. 352. Fig. 353.

Figs. 352, 353.—Case of deformans chondral dysplasia. Note bulging of eyes and deformity of mandible caused by the tumor growths.

Neck.—Negative except for a few small palpable lymph-nodes. The chest is poorly developed. The supra- and infraclavicular fossæ are depressed. The supraspinatus fossa of the left side posteriorly is depressed. The ribs and clavicles are very prominent and appear normal in size. The breasts are also normal.

Lungs.—Expansion good. No areas of dulness over the lungs anteriorly or posteriorly. Percussion, if anything, is hyperresonant. Vocal fremitus and breath-sounds normal. Width of the apices and bases are normal.

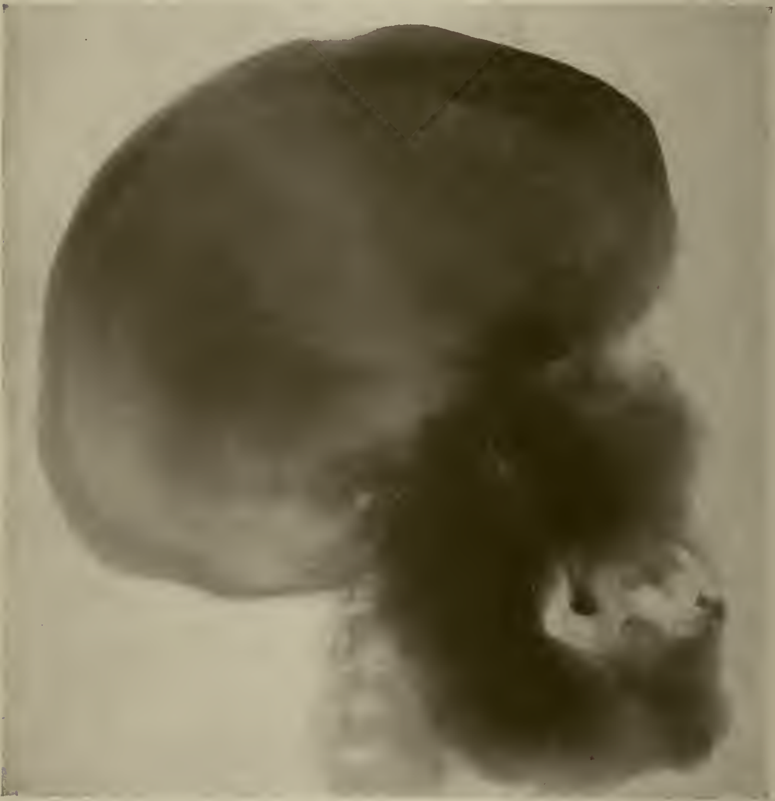

Fig. 354.—Roentgenogram of skull of patient shown in Figs. 352, 353. Note diffuse thickening of skull bones as well as shadows of mandibular and maxillary tumors.

Heart.—Negative. Kidneys and spleen are not palpable.

Extremities.—Right arm is normal. On the left arm there is a bony growth occupying the lower third of the left humerus and extending into the elbow-joint. This is round and rather rough on its surface. It is hard and not tender. Ankylosis of the left elbow is present and motion is greatly limited. The forearm is apparently normal. No loss of function is noted in the muscles of the forearm (Figs. 355, 356).

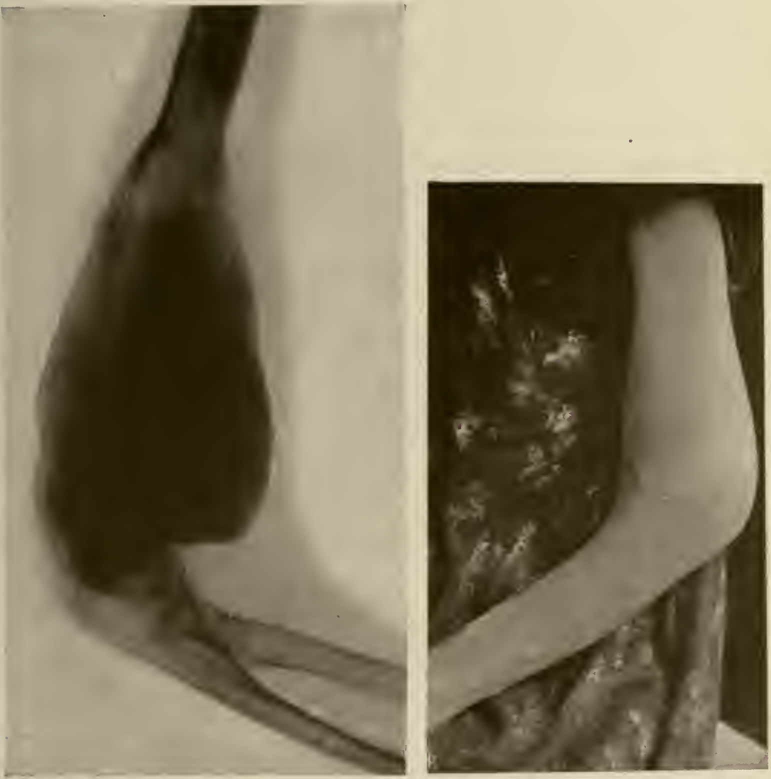

Fig. 355. Fig. 356.

Figs. 355, 356.—Roentgenogram and photograph of left arm showing tumor described in text.

Legs.—Negative except for a traumatic scar over the anterior surface of the left tibia. Both tibiæ appear shortened and slightly bowed anteriorly. On the whole, the lower extremities seem to be shorter than usual for a patient of her stature.

Genitalia.—Negative.

Reflexes.—Knee-jerks are absent. There is a negative Kernig sign, negative Babinski, and ankle-clonus and Romberg sign.

The diagnosis is hereditary deformans chondral dysplasia. This condition is also known as multiple cartilaginous exostosis and multiple congenital osteochondroma. It is a definite clinical entity, and has recently been studied by Ehrenfried. Although first recognized by Hawkins in 1839, the first complete study was made by Ollier in 1899. The characteristic findings in this disease are:

1. The occurrence of multiple, more or less symmetric osteo-cartilaginous growths upon the skeleton, being found on or near the ends of the long bones, but occasionally, as in our case, on the bones of the skull and face. The pelvic bones and vertebræ have also been known to be the site of these growths. These exostoses are generally benign, although cases have been observed where they have taken on a malignant character.

2. The disease is hereditary in a large percentage of the cases. Reinecke traced 172 cases in 36 families. In 12 the disease passed through two generations; in 15 it ran through three generations, and in 2 through four generations. In Ehrenfried's collection of 235 cases heredity was traced in 176. In our case there seems to be no other member of the family affected. In our clinic, four years ago, we treated two brothers who had multiple cartilaginous exostoses. In this family the father was also affected.

3. Other characteristic malformations are frequently, though not always, associated with these osteochondromata, namely, a low stature due to shortness of the lower limbs. As a rule, the lower limbs are more shortened than the upper. There is also frequently observed a relative shortening of the ulna and fibula producing, by the relative overgrowth of the radius, an apparent luxation of the bone at one or both extremities. In the lower extremity the lack of growth of the fibula causes a pes valgus. These deformities may be in evidence before the exostoses make their appearance. The latter may be insignificant or may never appear. The patients usually consult their physicians for some secondary manifestation of this disease, such as

the pes valgus or because of painful pressure of one or more growths, as in one of our cases in which a large cartilaginous tumor situated on the anterior surface of the upper end of the femur caused difficult and painful locomotion. In the case presented the large growth on the lower jaw causes an unsightly deformity. The exostosis on the skull is extremely sensitive to pressure, that on the superior maxilla causes an obstruction to the nasal passages, and those on the arms are only slightly painful and cause but little inconvenience. You also note that the *x*-ray of the cranium shows a thickened skull resembling concentric hypertrophy. The disease also causes disturbances of vision and hearing, which we find present in this case.

Pathology.—The disease occurs most frequently in males. Reineke traced a proportion of 3 males to 1 female. Ehrenfried had 5 males to 2 females. It occurs in all races, in all countries, and in all lower animals. The underlying pathologic change is a chondrodysplasia affecting the metaphyses of the long bones principally. The epiphyses are seldom deformed. The intermediary cartilage is irregularly formed, and frequently prematurely ossified cartilaginous deposits are found along the shafts of bone. These may remain unossified or present partly calcified areas. The cartilaginous deposits later develop into osteochondromata or chondromata. In fact, we may say that the disease represents a disturbance at the intermediary cartilages during the period of growth of the skeleton. This dysplasia of the normal process may occur wherever bone is being laid down in cartilage. In the radiogram we see what appears to be a cystic change in the ends of the long bones. These light spaces are due to the irregular distribution of cartilage cells.

The **prognosis** in a case of this character is uniformly bad. Nothing in the way of a cure is known. When the exostoses limit the movements of joints by size and location, they may be removed. In the case previously referred to that was treated in this clinic removal of large growths from the upper ends of the femurs permitted flexion of the thighs and relieved the pain that before had been intolerable when walking was attempted.

Etiology.—Little is known as to the cause of dysplasia. Tordens considered that the underlying cause was a disturbance of the central nervous system. Other authors have seen a relationship between the disease and disturbance of function of the thyroid. It has been noted that in goiterous locations this disease seems to be more common. The arrest of development, evidenced by the shortened statures, has been thought to be allied to the arrest of growth seen in the cretins. Others see a relationship between it and secondary or late rachitis. We may say, however, that at the present time the etiology is unknown.

CLINIC OF DR. MALCOLM L. HARRIS

Henrotin Memorial Hospital

HERNIA OF THE BREAST

Summary: A girl of fifteen presenting a swelling of the right breast due to escape of the glandular elements into subcutaneous tissues through an abnormally large aperture in their fascial covering; treatment—palliative and radical; result one year after operation.

The case which I am about to describe is quite unique in my experience. Miss B., a girl about fifteen years of age, was brought to me by her mother on account of an apparent enlargement of the right breast. The girl was well developed physically, and her health in every respect quite good; menstruation appeared at the age of thirteen and was normal in type and regularity. With the appearance of menstruation the breasts began to enlarge in the usual way, but about a year ago it was noticed that the right breast, which was slightly larger than the left, was becoming more prominent about the nipple. It was on account of this prominence of the breast about the nipple that led the mother to seek the advice of her family physician, who referred the case to me.

The girl, who was the picture of health, had had no serious illness, and, aside from the condition of the breast, had no trouble whatever. An examination of the breasts showed the right slightly larger than the left and both quite well developed for a girl of her age. The nipples were small and flattened. From the center of the right breast there protruded a large dome-shaped mass, measuring 7 to 8 cm. in diameter at the base and raised about 6 to 7 cm. from the surrounding surface, the nipple occupying the apex of the mass (Fig. 357). The areola, which was normally pigmented, was considerably enlarged and covered the top of the mass. The mass felt firmer than ordinary fat and was distinctly lobulated. Surrounding the base of the mass could be felt a well-defined subcutaneous ring with a distinct, rather sharp edge (Fig. 358, 1, *A*). The ring felt exactly like the opening at the umbilicus in an umbilical hernia, except the edge of the ring was not so thick, while the mass felt very much like a bunch of omentum in an umbilical hernia. With gentle pressure the mass could be pushed back through the ring, very much as one reduces an ordinary hernia, when the breast resumed a normal appearance except the areola, which became wrinkled and puckered. On removing the pressure the mass immediately reappeared by simply sliding out again through the ring. As the mass appeared the rotundity of the breast diminished accordingly. It was perfectly evident that the mass was the gland proper, which slipped through a rather large opening in the subcutaneous fascia which normally covers the breast and retains it in place.

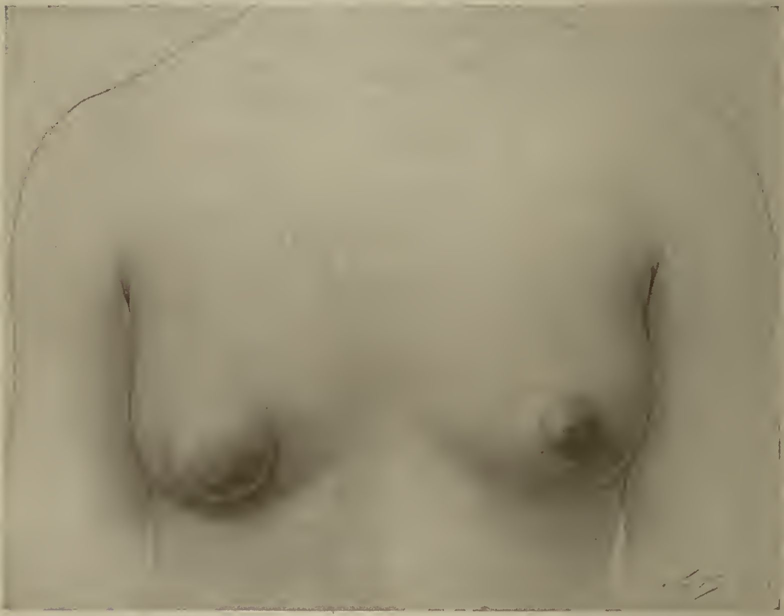

Fig. 357.—Hernia of breast. Note marked protrusion of right breast in region of nipple.

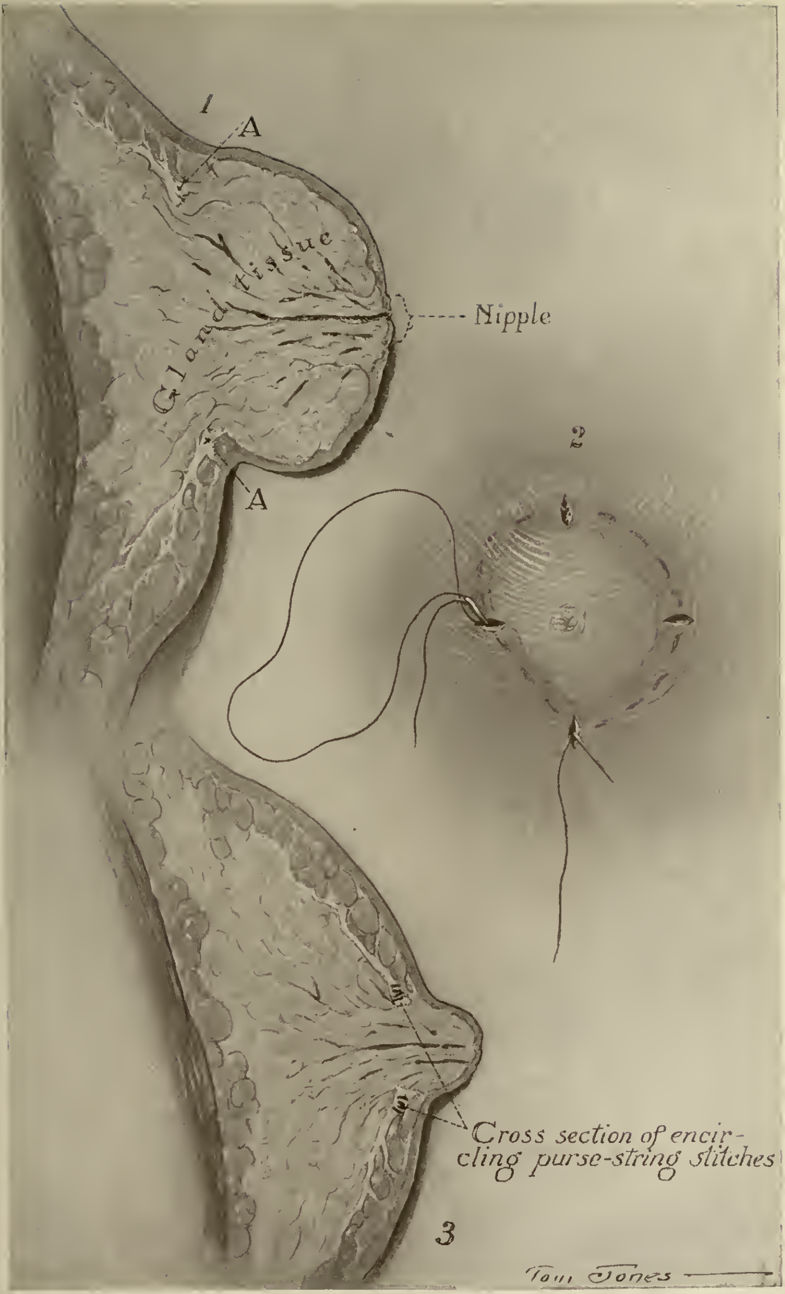

Fig. 358.—1, *A*, Cross-section of breast before operation, showing relative width of opening in fascia and protrusion of breast tissues. 2, Insertion of purse-string sutures. 3, Condition after operation was completed.

The whole process was so analogous to an ordinary rupture that the term "hernia of the breast" seemed to me not inappropriate. The interlobular connective-tissue septa, which are attached to or become continuous with the subcutaneous fascia, and which fix the breast quite firmly as a rule to this fascia, seemed to be practically absent, or so stretched as to offer almost no resistance to the gland sliding around under the skin and slipping out through the opening in the fascia when it was not retained by pressure.

As there was a slight tendency for the left breast to develop the same condition, a double breast supporter of firm webbing was made and applied, with instructions to wear it continuously. The support retained the gland nicely and there was no tendency for it to slip out while it was worn. The patient wore the supporter faithfully for a year, at the end of which time, as there was no improvement in the condition, an operation was proposed to see if the gland could not be permanently restrained from slipping through the ring.

The patient was glad to have anything done which seemed to offer a prospect of ridding her of the necessity of wearing the supporter. Therefore in June, 1916, the following operation was done: Under local anesthesia four small incisions, each about 8 mm. in length, were made in a radiating direction, dividing the circumference of the areola into four equal parts. The incisions extended through the skin and were just within the ring of subcutaneous fascia, through which the breast was escaping. A long straight needle, armed with soft twisted silk, was introduced through one of the small incisions so as to pick up the edge of the ring. Several bites were taken in the edge of the ring until the point of the needle had reached the next small incision 90 degrees removed, when the needle was brought out. It was then reintroduced through the same opening and the next 90 degrees of the circumference of the ring taken up in the same way, and the needle brought out at the next small incision. This procedure was repeated until the needle was finally brought out at the incision through which it first entered (Fig. 358, 2). We now had a circumferential subcutaneous stitch in the edge of the ring; three more stitches were placed in the same way, each a little farther out in the edge of the ring, making four rows of silk sutures surrounding the opening. The sutures were then drawn up, narrowing the ring (Fig. 358, 3), but leaving it large enough to give free passage to the ducts leading to the nipple, when the threads were all tied, the ends cut short, and the four small incisions closed with horsehair.

The scheme of the operation is well shown in the illustrations. After the operation was completed it was found that the gland was retained and the hernial protrusion no longer occurred. It was hoped that the silk, being non-absorbable, would not only act mechanically in restraining the breast from herniating, but that it would cause sufficient new connective tissue to be formed to permanently strengthen the subcutaneous fascia of this region, and thus prevent the recurrence of the hernia.

The result of the operation has been very satisfactory, and at the end of a year there has been no recurrence.

This case is quite unique. It is the only one of the kind that I have seen, nor have I been able to find a similar case reported in the literature. The condition is undoubtedly congenital in its origin, and it must be due to an imperfect development of the fascia covering the breast and of the interlobular connective-tissue fibers which normally fix the gland to the subcutaneous fascia and skin. This latter fault permitted the gland to slide freely beneath the fascia, and the defect in the fascia surrounding the nipple permitted it to slip through this fascia and lie directly beneath the thin skin of the areola.

CLINIC OF DR. E. WYLLYS ANDREWS

Mercy Hospital

HEMANGIOMA OF BRAIN, INOPERABLE BY ORDINARY METHODS, TREATED BY BOILING WATER INJECTIONS AND HOT METAL POINT

Summary: Patient presenting symptoms of intracranial tumor; discovery of angioma at operation; philosophy of the plan of treatment followed; differentiation between intracranial angioma and telangiectasis.

This lady, forty-four years old, has had well-marked focal symptoms referable to the right Rolandic area, papillitis, optic atrophy, and slight seizures pointing unmistakably to brain tumor. There is paresis in face, arm, hand, and leg of the opposite side, and progressively increasing headache and loss of vision.

Dr. H. T. Patrick has diagnosed "intracranial tumor" and advised surgical intervention. The large parietal plastic flap made over the affected area showed a slightly discolored outer table of the skull, bluish vessels showing through the thin bone in an unusual way. The first trephine opening exposed pulsating nevi of the diploë and had to be sealed with Horsley's wax. Next the trephine was placed at an adjacent point, and on slight pressure broke through the thinned outer table, opening large sinuses which seemed part of a hemangioma occupying the place of the inner table, diploë, and meninges to an unknown depth. The bleeding was arterial in strong pulsations and had to be held by pressure (Fig. 359, 1).

My conclusion was that if the vessels are from the meningeal branches they could be tied by further dissection, but that if the telangiectasis sprang from the middle cerebral it would be uncontrollable by external operation. I therefore tamponed the outer wound with bits of catgut and little grafts of the patient's

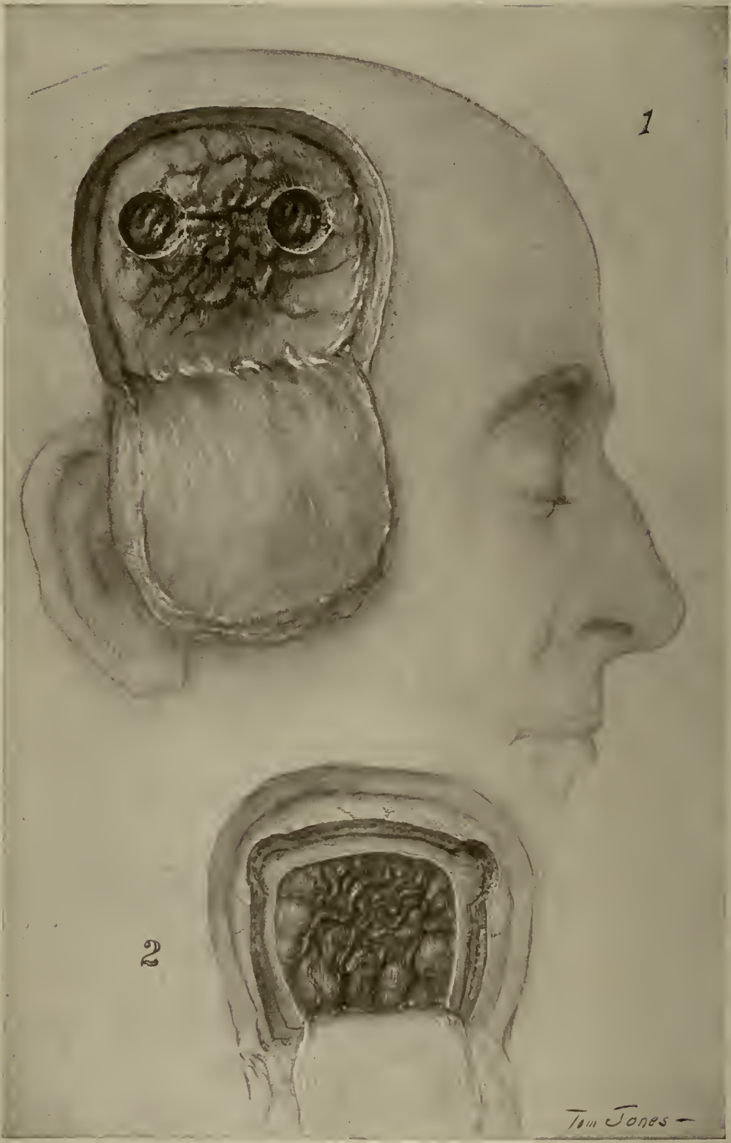

Fig. 359.—1, Hemangioma of the brain and dura eroding tables of the skull. 2, Telangiectasis (not malignant).

muscle, which controlled the bleeding without great pressure. Subsequently I injected boiling water in 1- to 4-c.c. charges, puncturing the scalp and thin bone with a stout needle. After a few daily repetitions of this injection I operated again, taking counsel with Dr. Patrick, who decided that such a growth might be glioma, even though no solid mass was found near the surface. I now ligate the external carotid, and, on reopening the wound, find a very bloodless scalp and pericranium, but no cessation of the pulsation in the vascular mass. This demonstrates that its blood-supply comes from some deep connection with the cerebral vessels and makes free dissection unsafe. Doubtless in such a cavity bleeding could be stopped by packing against the bony margins, but at the cost of producing an intracranial hematoma of dangerous extent.

Dr. Patrick had suggested ligation of the internal or common carotid instead of the external, but I refrained from doing this, as both sides of the neck might need ligatures, causing, almost certainly, cerebral anemia and death.

I now use large heated copper cautery points—the ordinary soldering irons of the tinsmith—pressing them firmly against the bleeding masses after reflecting the old horseshoe-shaped flaps by removing the stitches of the first operation.

This seems to cause wide and deep coagulation, nevertheless not entirely checking the bleeding. Bone, pericranium, and probably dura, and a certain layer of deeper tissue are devitalized but not charred, the irons used being of a dull, not a glowing, heat. Over the eschar the pericranial flap is again sewed.

POSTOPERATIVE COURSE

Primary union took place, with no drainage and no delay in clean healing. Doubtless clean aseptic sloughs can be taken care of in wounds like other foreign bodies. The immediate relief from this treatment was very marked. No increase of paralysis, rather a decided improvement, set in. The eyegrounds cleared remarkably. As to the end-result, a most conservative prognosis is advisable, inasmuch as a tendency to recurrence will appear unless we obtain complete extirpation of the mass, especially if we are dealing with hemangioma rather than telangiectasis.

Two cases of intracranial telangiectasis were reported in 1915 by E. Sachs (Amer. Jour. Med. Sci., II, 565). One of these seemed to be of dural origin and the other from the deeper vessels. Cushing draws attention to the vascular growths of the dura in association with trigeminal nevi. Adami and Virchow differentiate clearly between angioma and telangiectasis. The latter is a dilation of existing vessels, no neoplastic vessel structures appearing. In true angioma (hemangioma) new vessels are formed. They may be from capillaries, veins, or from arteries. In true neoplasms no vessels with three coats are formed. Sachs found in both his cases normal structures in the vascular walls. It is not a question of academic interest only, but of vast practical import, which type we are dealing with, since in telangiectasis cure by ligation can be obtained, while in true angioma nothing but complete excision offers hope of cure.

The patient shown has certain differential points leading to the fear that the growth was angioma rather than telangiectasis. These are to be summarized as follows:

1. *Angioma.*—Increased intracranial pressure must be expected, since there is a new growth inside the cranial walls. Convulsions are usually present, especially when the growth is near the cortex, but there may be no unconsciousness before or after the seizure. The intracranial pressure being increased by local encroachment, there are focal symptoms, such as motor paralysis or other signs pointing to cortical irritation. The optic atrophy will increase progressively until the vision is lost in one or both eyes, hemianopsia being detected early in many cases. The motor paralysis is also progressive, since the tendency is for the angioma slowly to enlarge at the expense of the other structures. The absence of nevi in other locations, as about the head and face, will help to differentiate angioma from telangiectasis. The absence of syphilis is best tested by a Wassermann made upon the spinal fluid or fluid from the ventricles.

2. *Telangiectasis.*—This other type of intracranial vascular growth is, in reality, an enlargement of the normally existing vessels. The growth does not, as a rule, produce increased

intracranial pressure. It might be almost symptomless or produce but slight pressure symptoms (Fig. 359, 2). As a rule, no epilepsy or any form of convulsions appear, or if present they occur at long intervals. There are no paralyses or focal symptoms in most of the recorded cases. A number of these cases have been reported by Sachs in the American Journal of the Medical Sciences for 1915. As in hemangioma, the absence of all signs of brain syphilis is to be noted. In not a few of the recorded cases the clue to the pathology was found in the existence of other nevi, as of the head, face, or skin in general, thus proving the tendency in the individual to a congenital telangiectasis in various membranes of the body.

CLINIC OF DR. DALLAS B. PHEMISTER

PRESBYTERIAN HOSPITAL

BRAIN CYST FOLLOWING SKULL FRACTURE

Summary: Jacksonian epilepsy and headache developing four years after compound fracture of skull; operation—discovery of cyst—treatment by gauze packing; peculiar postoperative course; causes of cyst formation.

THIS patient, L. S., age twelve, was admitted to the hospital February 20, 1917, because of attacks of epilepsy which he has been having during the past four months.

He was a normal, healthy child up to four and one-half years ago, when he was struck on the left side of the head above and back of the ear by a pole from a hay-wagon. The blow rendered him unconscious and produced a compound fracture of the skull from which some brain tissue escaped at the time. Consciousness was gradually regained after forty-eight hours and the wound healed promptly with little or no infection. The father states that no necrotic bone or other tissue was removed. He was confined to bed for three and one-half weeks, after which his condition returned to normal. No paralysis, disturbances in speech, or other focal symptoms were noticed during his convalescence from the injury. He has attended school regularly. No special mental disturbance has been noticed, although the father says that he has been perhaps more quiet and solitary than before. During the past year he has had repeated attacks of headache, usually in the occipital region, lasting for a few hours, but not accompanied by nausea or vomiting.

Four months ago while in school he suddenly developed a queer feeling and jerking in the right hand, which was rapidly followed by unconsciousness and jerking of the entire body. Consciousness soon returned, but he felt drowsy, and had a headache for the next twenty-four hours. Vomiting occurred soon after the attack.

He was then apparently all right except for frequent headaches until one month ago, when he had a second attack. It started with twitchings in the right hand, which caused him to scream and grab it with his left hand. The twitchings extended to the entire body and lasted about two minutes, but he did not lose consciousness. Weakness and headache followed. Since then he has had similar attacks which were severe enough to cause him to fall to the floor, but without loss of consciousness.

There has been no change in his physical or mental condition since the attacks began. He has wet the bed most of the nights during the past year, which he had not done since infancy, but no nocturnal epileptic attacks have been observed.

Father is living and well. Mother died at thirty-six of childbirth. One brother and one sister living and well. No nervous diseases in the family.

Physical Examination.—The patient is a well-developed male child, somewhat reserved and backward in appearance. He answers questions intelligently and shows no defects in speech or motion. There is a scar and a moderate uneven depression about 1½ inches long over the left parieto-occipital region, extending downward almost to the left mastoid. It is 1½ cm. wide above and 1 cm. wide below. Palpation reveals the absence of bone over a portion of the depression and pulsation can be seen and felt.

Eyes.—Entirely negative. Vision and eye-grounds normal. No nystagmus.

Smell, taste, and hearing normal.

A physical examination of the rest of the body was negative except for a feeble Babinski on both sides, more marked on the right.

The *x*-ray picture of the head (Fig. 360) shows an elliptic defect of the skull about 1½ inches long, extending upward and slightly backward from the top of the left mastoid. There is no evidence of any fragments of bone within the brain substance, and only a slight depression of the posterior margin of the upper portion, as seen stereoscopically.

A diagnosis of traumatic epilepsy was made, but the exact nature of the changes within the cranial cavity was not predicted.

At operation, two days after admission, a horseshoe-shaped flap, with its base on the level of the upper limits of the mastoid, was turned down from the parieto-occipital region, the anterior margin of the bone-flap bordering on the linear defect in the skull (Fig. 361, 1). A large cyst could be seen and felt in the anterior portion of the exposed area and in the region of the defect in the skull, where the dura mater was irregularly thickened and scarred (Fig. 361, 2). The cyst was opened in this region and about 200 c.c. of a clear colorless fluid escaped, or was sponged out. The membranes were fused into one layer over the surface of the cyst, which extended deep into the substance and well anteriorly and posteriorly. There was a thin fibrous lining to the cavity,

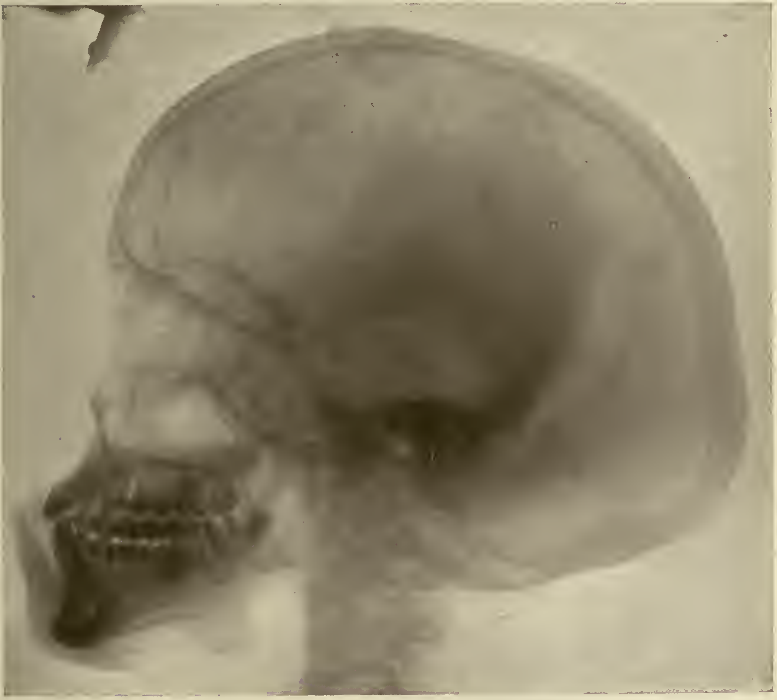

Fig. 360.—Roentgenogram showing fissured defect in skull at site of old fracture.

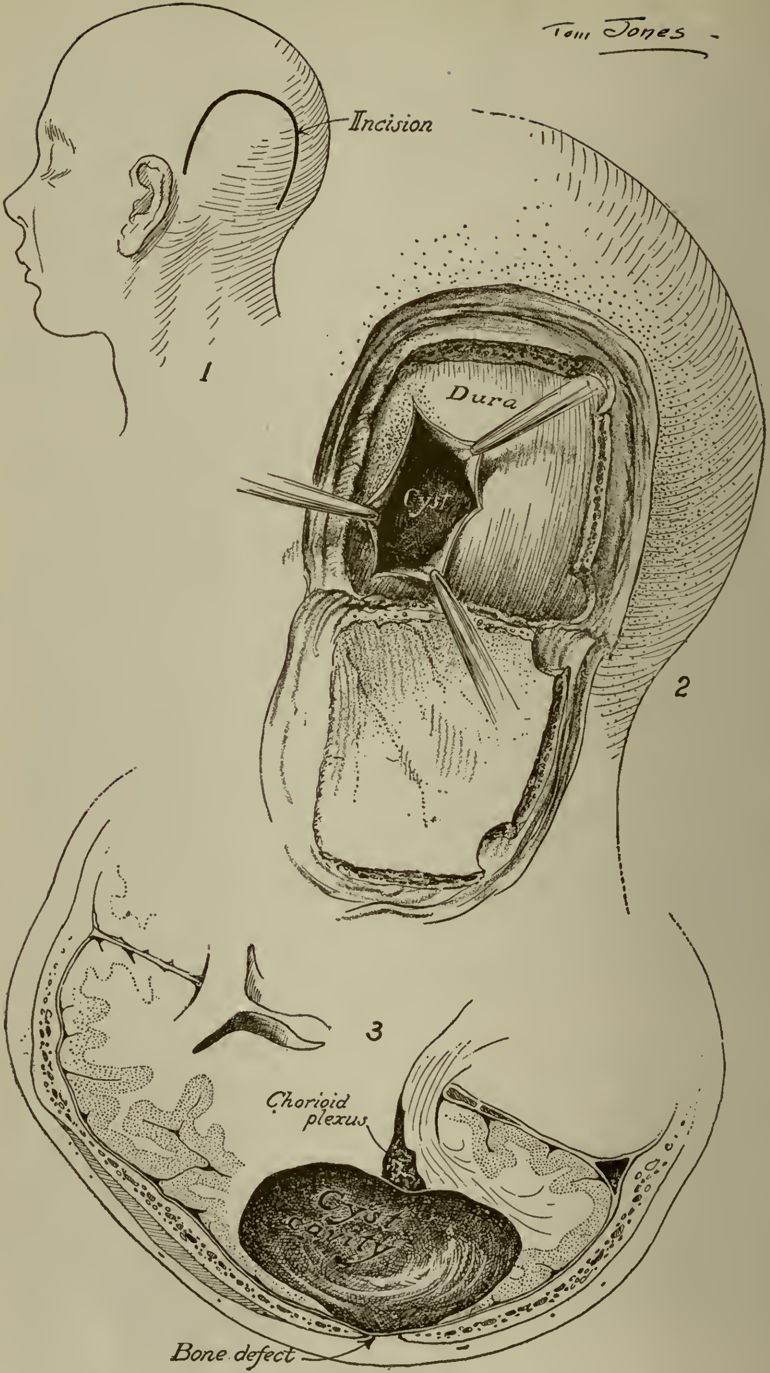
Tom Jones
Incision
1
Dura
Cyst
2
3
Chorioid plexus
Cyst cavity
Bone defect

Fig. 361.

which had smooth walls without any trace of convolutions or gyri. On the inner wall of the cavity a reddish mass containing blood-vessels could be seen, which was taken for the choroid plexus of the lateral ventricle (Fig. 361, 3). That the vessels were not those of the flattened out cortex seemed evident, as they did not run to the superficial portion of the cyst wall. No pieces of bone could be felt along the wall, and the depression in the bone-flap was very slight.

We were confronted with the interesting problem as to the best method of dealing with this large cyst cavity. Simple drainage, fat transplantation, and packing with gauze were thought of, and the latter procedure finally decided on. The space was packed with a 1-inch plain gauze strip in the hope that the lining would be obliterated and that the brain substance would shift, gradually filling in the cavity as the packing came out. It was removed gradually, beginning on the third and ending on the ninth day after operation, when a gauze strip was inserted. There was a profuse discharge of a slightly blood-stained serous fluid during the first ten days, after which it gradually decreased and ceased soon after the removal of the gauze drain on the twentieth day. Examination about this time with a probe showed the cavity either narrowed down to a sinus or pocketed and shut off from the external opening.

The patient has run a very interesting postoperative course. The temperature has fluctuated greatly. On the afternoon of the operation it went to 106° F., but fell to 101° F. by the next morning. It stayed about this point for three days, when it again went to 104° F., and fluctuated between 101° and 104° F. for about one week. After this, during the past four weeks, it has been very irregular, running between normal and 100° F. for two to four days, then jumping to 102° or 104° F. of evenings for a day or two.

Fig. 361.—Steps of the operation: 1, Horseshoe-shaped incision through all the soft tissues down to the bone. 2, An osteoplastic flap has been turned back and the dura opened, exposing interior of large cyst. Note smooth edges of old defect in skull at anterior margin of flap and operative opening in skull. 3, Schematic drawing of horizontal section of head to illustrate position of cyst and its relation to choroid plexus, dura, and site of old fracture.

During the first four days after operation he felt fairly comfortable, was rational, and had no headaches. On the fifth day he had an attack. The right hand became numb, he felt very dizzy, and cried out, but there were no twitchings or loss of consciousness. During the next two weeks his mental condition remained fairly good. Then he gradually become dull and irritable, crying out at frequent intervals. Three weeks ago the right side of the body began to show signs of paresis, which condition has increased until now it is very marked, especially in the arm and leg. The mental confusion has gradually increased, and now he has a well-marked sensory aphasia. For the past two weeks he has vomited from one to three times nearly every day, and at first complained of some headache, but lately his mental condition has been such that it is impossible for him to make his complaints known. All the symptoms are increased with the sharp elevations of temperature. Dr. Peter Bassoe has gone over him recently and examined the eye-grounds, but has found no changes in them.

It is difficult to know just what is producing the boy's condition. With the irregular temperature, at times very high, the motor and mental disturbances, the vomiting, and gradual loss in general, one has to consider very strongly the existence of an infection with perhaps abscess formation in or about the region of the cyst. But the wound, while it discharged a serous fluid, did not at any time appear infected, and repeated leukocyte counts have ranged between 8000 and 12,000, except one count of 23,000 on the fourteenth day.

Another explanation might be found in the enormous shifting of brain tissue filling in the cyst cavity as the packing was removed, thereby disrupting cerebral function and interfering with its heat and other centers.

We know that fever results from a variety of cerebral lesions. Hemorrhage, especially into the ventricles, may cause a very marked elevation of temperature. Krehl claimed that there is a heat-regulating center which is disturbed by a lesion between the frontal end of the thalamus and the corpora quadrigemina. Jakoby and Roemer state as a result of animal experimentation that there is no circumscribed heat center in the cerebrum proper, but that irritation here and there, as in the region of the basal ganglia and especially of the walls of the ventricles, may produce a rise in temperature.

Operative interference with the brain in man is frequently followed by marked temporary fluctuation in the temperature, but, of course, could not be the cause of the protracted temperature in this case.

The method of cyst formation is also of great interest. We know from the history that the meninges and brain were lacerated and that brain substance escaped from the wound; also that at operation the cyst extended deeply into the brain substance, apparently bordering on the lateral ventricle, and that no traces of convolutions could be seen on its wall. Hence it seems quite certain that the cyst developed in the injured brain substance. The source of the fluid is a matter of conjecture, but it probably came from the choroid plexus, bordering on the inner wall. The cyst cavity was completely shut-off by adhesions from the pia-arachnoidal space, consequently the fluid could not have come from this source.

The commonest form of cyst aside from cystic degeneration of pia gliomas is that from the pia-arachnoid, arising from localized inflammation, or trauma, or occasionally congenital in origin. This form is ruled out in the present case because of the anatomic findings that have been enumerated. Transformation of a hematoma into a cyst is the usual occurrence, but its fluid contents are stained dark brown due to the presence of the unabsorbed hemoglobin.

SUBSEQUENT HISTORY

The patient left the hospital four days later unimproved. Stupor became more marked and he died at the end of two weeks. No autopsy was obtained, so that the cause of death is in doubt. It was due either to infection, which got into the brain tissue without making any definite signs in the external wound, or to the marked cerebral injury from the shifting of the brain substance in the filling out of the cyst cavity.

CLINIC OF DR. NELSON M. PERCY

AUGUSTANA HOSPITAL

PARTIAL EVISCERATION THROUGH VAGINA DURING ATTEMPTED ABORTION

Summary: Anterior vaginal wall and bladder torn through and 20 inches of large intestine stripped of its mesentery and pulled out of abdomen during ill-directed and unsuccessful attempt to empty uterus; immediate laparotomy and successful repair of injuries.

HISTORY

This patient is a young woman twenty-six years of age. Her past and family histories are entirely negative. She has a child of three years living and well. Labor was normal. No other pregnancies previous to the present one.

The last menstrual period occurred on April 16th. On May 21st, the menstrual period being one week late, the patient decided she was pregnant, and, according to her story, attempted self-abortion by introducing a rubber catheter into the cervix. She further claims that a bloody flow accompanied by cramps over uterus began two days later, which was two days ago, and persisted until the evening of May 24th, at which time she first consulted a physician at his office. The physician decided that a completion of the abortion was indicated and proceeded to empty the uterus then and there. No anesthetic was used. "The doctor inserted instruments and worked for a long time, causing most excruciating pain and severe bleeding." After working about two hours the doctor decided he had perforated the uterus, as he encountered a loop of intestine in the vagina. An attempt was made to replace this and absorbent cotton was packed in the vagina to control the hemorrhage. She was then placed in an ambulance and brought to Augustana Hospital.

Examination.—We find a well-developed and well-nourished young woman, conscious and rational, but greatly exhausted and suffering pain through the lower abdomen. There is marked pallor, the respirations are 32 per minute, the pulse-rate is 130 per minute, but of fair quality. Blood-pressure: systolic 100, diastolic 75. Hemoglobin, 65 per cent.; red blood-corpuscles, 3,500,000; white blood-corpuscles, 18,000. Differential count shows no normoblasts. There are 80 per cent. polymorphonuclear leukocytes. Auscultation discloses a murmur, which we take to be hemic in type, over the cardiac area. The chest is otherwise negative. The head, eyes, ears, nose, throat, neck, extremities, and reflexes are negative, save for marked pallor of the mucous membranes.

Palpating, we find that the abdomen is tender over the lower portion. It is flat to percussion in the flanks. Local examination discloses blood-soaked clothing and bleeding from the vagina. The vagina has been packed with cotton. Three wads of cotton are removed from the vagina, and digital examination reveals a slightly soft cervix, but no evidence of recent dilatation. The size of the uterus, as nearly as can be determined, is only slightly larger than normal. On bringing the finger anteriorly from the cervix an opening fully 4 cm. in diameter is found in the anterior vaginal wall extending through the bladder into the abdominal cavity. A loop of intestine protrudes into the vagina and a large wad of cotton can be felt in the abdominal cavity through the opening in the vagina and bladder. We will perform a laparotomy on this patient at once.

OPERATION

Under ether anesthesia a low median incision is made. Free blood, containing numerous clots, estimated at from 1000 to 1500 c.c., pours out of the abdominal cavity. Three wads of cotton, each about half the size of a man's fist, come into view and are removed. The loop of intestine that we felt in the vagina upon digital examination proves to be the sigmoid flexure of the colon. The patient has an extremely long sigmoid flexure and a loop of this, 20 inches in length, has been separated completely from its mesentery. The torn mesentery is still bleeding, and this is undoubtedly the source of the free blood in the abdominal cavity. There is also an opening extending through the posterior and anterior walls of the bladder and the anterior vaginal vault. It is about 2½ inches in diameter, and practically divides the bladder into halves. The anterior surface of the uterus is entirely free from the bladder and vaginal attachments. The tear in the bladder begins on the anterior wall near the urethra, and extends through the base of the bladder and the posterior wall almost to the symphysis pubis. The entire length of the tear is 4½ inches. The uterus is somewhat enlarged and resembles a six weeks' gestation, and, as far as can be determined in this hurried survey, no instruments have entered the uterus (Figs. 362, 363).

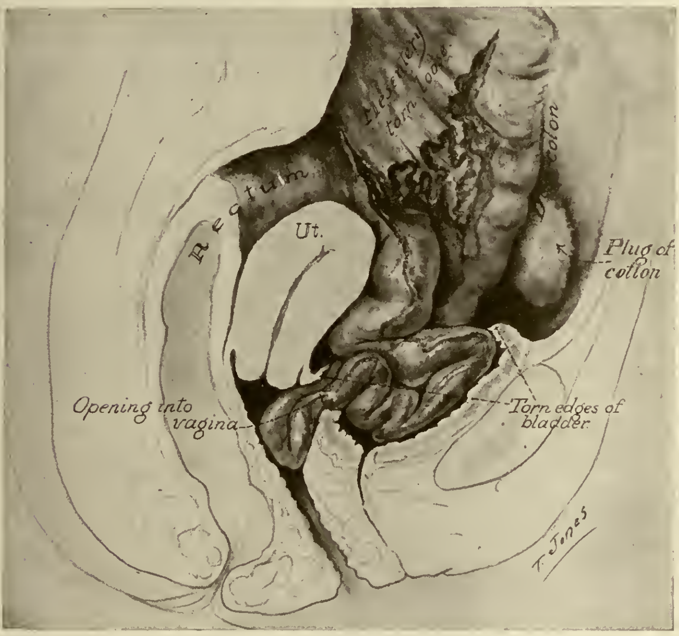

Fig. 362.—Illustration to show opening between vagina and bladder with large laceration of bladder. A loop of sigmoid devoid of mesentery fills bladder and protrudes into vagina. Note plug of cotton—one of several found.

You will note that I have ligated the bleeding points on the torn mesentery and am engaged in the suture of the bladder wound. The bladder and anterior vaginal wall having been completely separated from their attachments to the uterus, it is possible to make the entire bladder repair from within the abdomen. By grasping the torn edges of the bladder with numerous mouse-toothed forceps, the bladder is pulled up into the pelvis far enough for suturing, and you see that I am closing this big rent by two rows of fine chromic sutures of the Lembert type in the bladder wall, and then by a third row I am approximating the edges of the vagina below, and as I come up into the abdomen am covering the bladder sutures with peritoneum. A Jacobs retention catheter is placed in the bladder through the urethra. We next proceed to resect the loop of sigmoid which has been stripped of its mesentery, 20 inches in all, and make an end-to-

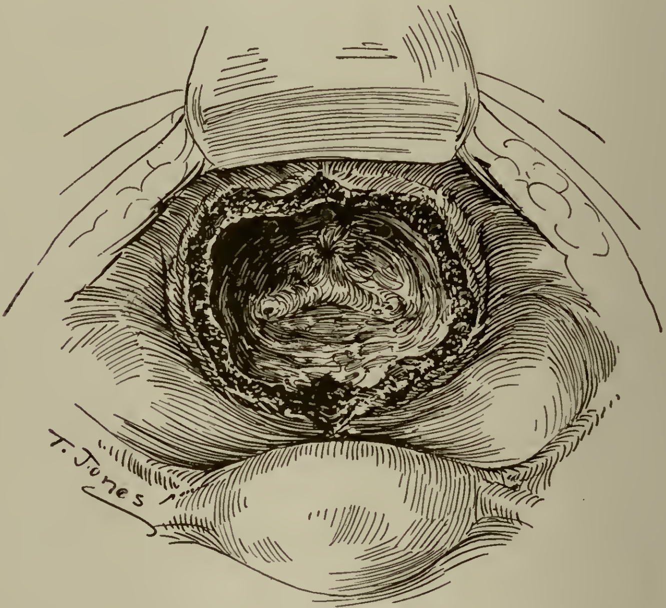

Fig. 363.—Top view of bladder as seen through abdominal incision. Laceration completely divides superior wall of bladder.

end anastomosis of the two ends of the sigmoid in the usual manner (Fig. 364).

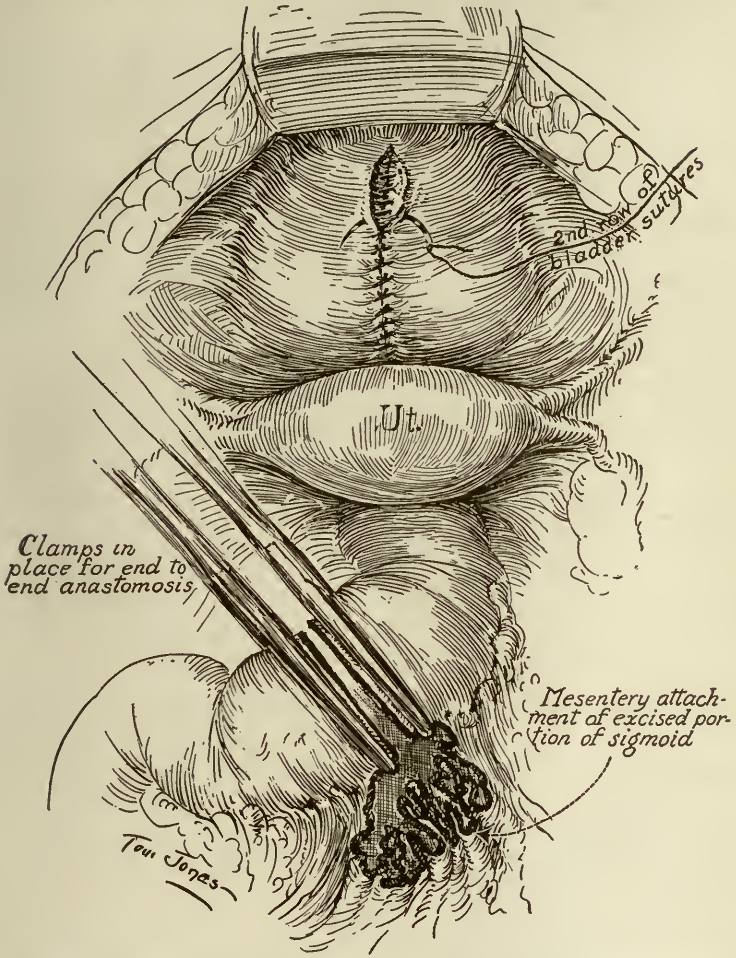
2nd row of bladder sutures
Ut.
Clamps in place for end to end anastomosis
Mesentery attachment of excised portion of sigmoid
Tom Jones

Fig. 364.—Operative procedure. Bladder and vagina sutured. Sigmoid resected and end-to-end anastomosis begun.

The uterus has not been injured and the gestation apparently has not been disturbed. For drainage, we will carry three cigarette drains into the pelvis behind the uterus, bringing them out through the lower end of the incision, and the remainder of the wound we close in the usual manner. A hypodermoclysis of 1200 c.c. of normal salt solution is now given and the patient will be sent to her bed.

Postscript.—There was very little shock following the operation, but the pulse ranged from 110 to 120 per minute for three days, after which time it did not go above 90 per minute. The temperature did not go above 100° F. at any time, and remained normal after the fourth day. There was no leakage of urine, urinations being normal after removal of the retention cathether on the tenth day. Beginning on the third day after operation, 1 ounce of liquid paraffin was given by mouth morning and evening, and on the fifth postoperative day an olive oil enema was given, resulting in a free bowel evacuation. The bowels moved normally from this time on. On the fifteenth postoperative day there was a flow of bright red blood from the uterus, but no fetus or evidence of placental tissue. The flow ceased in a few hours and it looks now as though the pregnancy may go on uninterruptedly.

CLINIC OF DR. CARL BECK

NORTH CHICAGO HOSPITAL

TENDO- AND NEUROPLASTY

Summary: Two cases illustrating the practical application of certain methods of tendon and nerve repair—suture, interposition of foreign material, and autoplastic grafts.

THIS patient was thrown through the broken wind-shield of his automobile. His left hand was cut on the ulnar side of the palm about 1 inch below the wrist line, transversely, so that the nerves, tendons, and blood-vessels from the medial side of the forearm were all severed. He was taken to a doctor who stopped the hemorrhage and sewed up the wound, endeavoring at the same time to connect the severed ends of the tendons. His efforts, however, were not successful. About a week later the sutures sloughed out and a thick scar developed at the site of the junction of the tendons and the nerve. Three weeks later the patient applied to me for help.

His left hand was more or less helpless; the thumb and the first finger could be moved, although not through the normal range. The result of the injury and the subsequent suturing of the wound was such that the continuity of the ulnar nerve was entirely destroyed. There was anesthesia corresponding to its peripheral branches on the three medial fingers. The muscles of the inner portion of the hand were all useless; the three medial fingers were fixed in slight flexion. When the patient tried to bend the fingers the pull of the forearm muscles on the scar at the wrist was very noticeable (Fig. 365).

We decided to expose the region of the scar and, if possible, repair nerve and tendons by suture. Accordingly, we excised the scar and first located the proximal and distal ends of the ulnar nerve. The proximal was somewhat thicker than the distal portion, and the distance between them was so great that they could not be approximated. It therefore became necessary to lengthen the nerve by cutting off a lateral graft from the proximal portion with which to bridge the defect. The tendons were also brought together, repairing first the flexor carpi ulnaris, which was done with considerable ease. The tendons of the long flexor muscles were more difficult to handle, and it required a good deal of flexion of the hand to bring them together. Nevertheless we succeeded. Then we placed the hand in an overflexed position over a gauze roller and a splint. We kept the hand in this position for ten days. Primary union took place and we were gratified to see that we had succeeded in a part of our task, especially with regard to the little finger, which, by means of its special flexor tendon, could be flexed to a certain degree. The ring-finger was drawn down considerably, could not be flexed more, and remained in the hyperflexed condition no matter what we did. The middle finger was also drawn down to

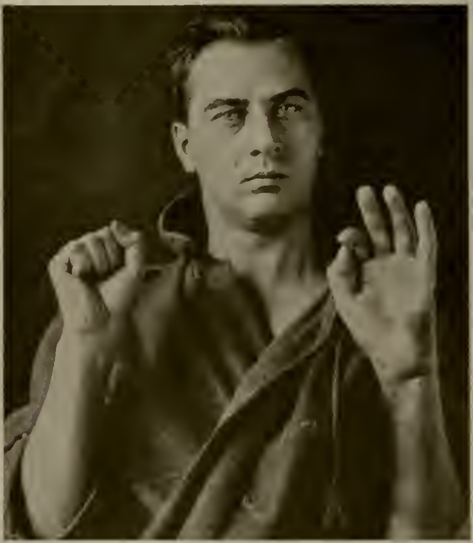

Fig. 365.—Condition of the hand before anything in the way of plastic was done, showing the paralytic condition of the fingers supplied by the ulnar nerve.

a certain degree, but could be flexed somewhat in connection with the little finger. The thumb, because of its prolonged period of inactivity, had lost some of its function, although it was not injured. After many weeks of massage, electricity, and passive and active motion the patient became able to flex the hand almost to the normal degree, but he could not extend the fourth finger nor the middle finger because of the contraction which had taken place in the scar. The fourth finger especially was a great drawback to every motion (Fig. 366).

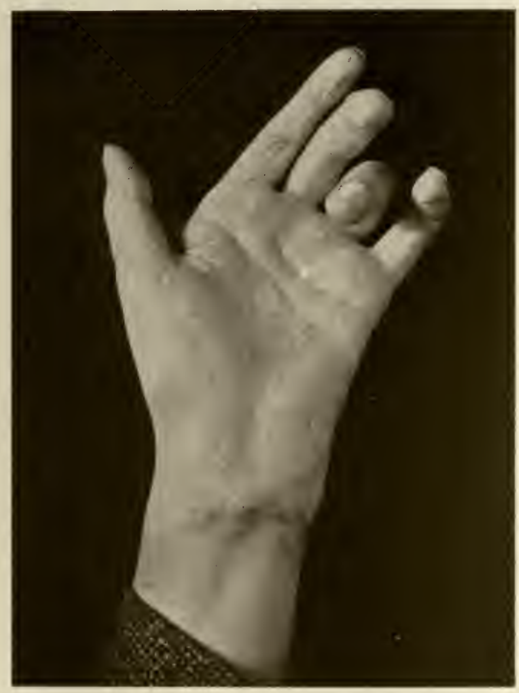

Fig. 366.—Condition after the first operation, showing contracture of the third, fourth, and fifth fingers.

We had obtained through our operation union between the flexors, but we had not obtained individual union of the flexor profundus and the flexor sublimis, so that there was no separate action of these two muscles. It occurred to me, therefore, since the hand could not be used in this fashion, that a second plastic was necessary, namely, lengthing of the flexor tendons, so that the fingers could be extended. While this would not provide the superficial and deep flexors with the power of independent action, and would, as a matter of fact, when performed in the manner which I intended, forever preclude such a possibility, it would at least restore to the hand some degree of usefulness. My procedure was as follows:

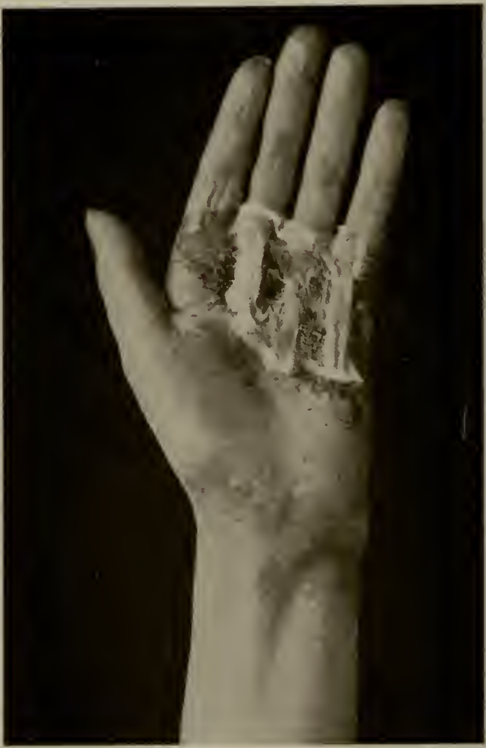

Fig. 367.—Condition shown in Fig. 366 corrected. (Photograph taken shortly after operation.) The incisions in the palm of the hand are covered with gauze strips.

I exposed the tendons of the middle, ring-, and little fingers in the palm of the hand and cut each of the tendons, which here lie one on top of the other, in such a manner that the superficial tendon was cut nearer to the wrist and the lower tendon nearer to the finger joints transversely. I then immediately stretched each finger to its utmost straight position and sutured the free ends of the lengthened tendons, making only one tendon out of two. The incision was then closed with great care. It healed by primary union within a week (Figs. 367, 368).

Again the patient was treated by massage, electricity, and passive and active motion, and today you see that he can use his hand, extending and flexing the fingers as far as the second joint, so that he can grasp anything (Fig. 369). Sensation has also returned. It is now seven months since the accident.

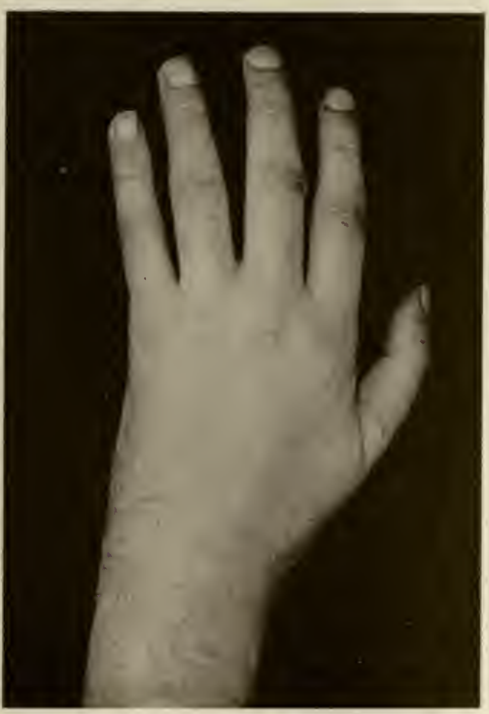

Fig. 368.—Dorsal view of the hand. Note that the fingers may be completely extended.

A similar very interesting operation on the tendons of the hand is that which was performed in the next case.

This gentleman is a foreman in a bakery. The skylight of his work-room collapsed and the patient was cut on the head and left hand by the falling glass, severing two of the tendons in the hand. The extensor of the middle finger was cut right across by a pointed piece of glass, and the two cut ends retracted about $\frac{1}{4}$ inch, leaving the finger in a flexed condition. The tendon to the little finger was cut by a similar incision, but a little closer to the wrist; the ring-finger also suffered from a transverse incision of the tendons, making it impossible to straighten out the little finger or the ring-finger fully. A week had elapsed since the injury when I first saw the patient. The first operation consisted in suturing of the extensor tendon of the middle finger under local anesthesia. It was very easy to expose the two transversely sharp cut tendon ends and unite them by suture.

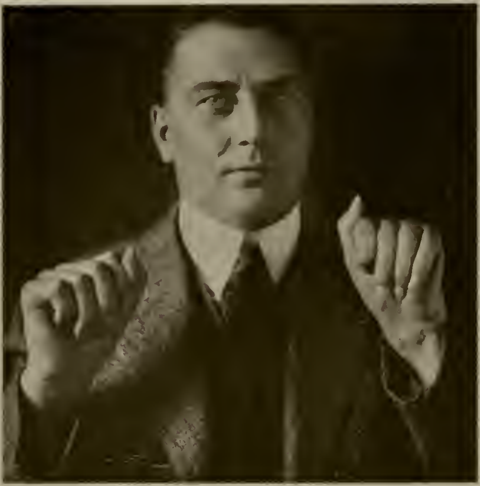

Fig. 369.—Final result. The first and second phalanges of the third, fourth, and fifth fingers of the left hand can be flexed and extended to the normal degree, but the terminal phalanges remain in extension.

The result was perfect and normal function was restored. Somewhat different was the condition in the little finger, where the extensor tendon had retracted beyond the transverse ligament. It was impossible to find the proximal end of the tendon. It was easy to find the distal end. I therefore sutured the distal end of the extensor tendon to the extensor tendon of the ring-finger laterally, thinking that they would act in unison, but I was disappointed. The finger dropped, as there was not enough traction on the tendon, and when the patient returned to work the little finger was always in the way. I therefore decided to attack the case once more. At this operation I exposed the retracted portion of the extensor of the little finger and filled the gap produced by the retraction of the muscle, which measured about $\frac{3}{4}$ inch, with silk, extending the finger as much as possible, and in that way producing marked hyperextension. Both operation wounds healed by primary union and the silk tendon is now working just as well as the natural tendon. The finger is now extensible almost to the normal with the other fingers and is no longer in the way of the working hand.

ELEPHANTIASIS AND ITS TREATMENT BY THE HANDLEY OPERATION

Summary: Lymphedema of leg following radical extirpation of inguinal glands; restoration of lymph drainage by the subcutaneous implantation of silk threads.

About eight years ago this patient, a factory foreman, was admitted to the hospital with a swelling in the left inguinal region, mostly inferior to Poupart's ligament. The absence of any syphilitic or other infection from the genitals and the preponderance of glandular elements made it probable that we had to deal with a growth of the lymphatics glands—a lymphoma. The pain due to the pressure of the tumor upon the nerves in the neighborhood, especially upon the anterior crural nerve, was very severe. Radical extirpation seemed the most reasonable and promising treatment.

The extirpation was made very radical and every vestige of gland tissue was removed clear down to the large vessels, which were, however, not disturbed. The external saphenous vein had to be ligated. A slow union took place extending over several weeks, a more or less serous or rather lymph-like discharge persisting for some time. However, all discharge eventually ceased, the wound healed, and the patient returned to his occupation.

In the course of time the limb on the operated side gradually increased in circumference. The greatest extent of the enlargement was below the knee, but it extended above the knee nearly to the hip. This enlargement seemed to have its seat mostly in the subsutaneous fat. The skin became very hard and unyielding. During the night the swelling slightly receded, but never disappeared. The patient tried to control the swelling by means of rubber stockings and bandages, but without avail. For a while he presented himself at intervals for examination, but during the last five or six years I lost track of him.

He again appeared in October, 1916, this time with a strong desire to have his ailment cured even if his limb should have to be amputated, as he could not stand this very heavy thickening and swelling of the limb, which prevented him from working and walking.

The pathologic diagnosis was elephantiasis of the subcutaneous and cutaneous tissue due to chronic stasis by disruption of the lymph-stream in the inguinal region. The appearance of the limb is clearly shown in Figs. 370 and 371. These show that the foot below the ankle is only slightly enlarged, that from above the ankle to the knee there is considerable enlargement, so that the contrast between the two limbs is exceedingly marked.

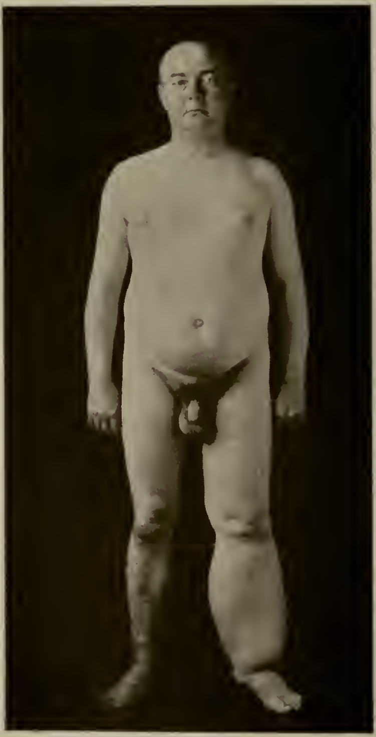

Fig. 370.—Front view of the patient before operation; the left limb is considerably larger in circumference than the right from the ankle to the hip. Note depression due to old scar in the left inguinal region.

Above the knee to the hip the swelling is much less in degree. It seemed to me that if I could produce a new lymph road, through the area of obstruction in the groin to connect with the lymphatics above, we might hope to give our patient relief. I decided to undertake this by the method given to us by Handley, who introduces silk threads into the tissues, thus defining tracts along which the lymph may flow.

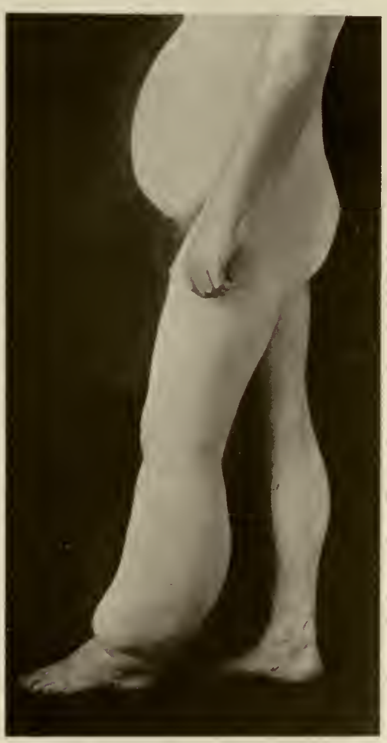

Fig. 371.—Side view of the enlarged limb.

I did this under local anesthesia on two different occasions in a manner which I am about to describe. A Reverdin needle about 3 inches in length was armed with a strand of the strongest braid-silk about 1 yard long. Starting above the ankle I perforated the skin in a longitudinal direction, taking as long a bite as the length of the needle permitted; the needle was then drawn on through and the thread pulled up so that its unarmed distal end disappeared beneath the skin. Next the needle was introduced through the same opening where it had come out and another subcutaneous suture was made of about the same length. This procedure was repeated again and again until we reached the neighborhood of the crista ilii. There the thread was cut so that its end dipped under the skin and left for healing.

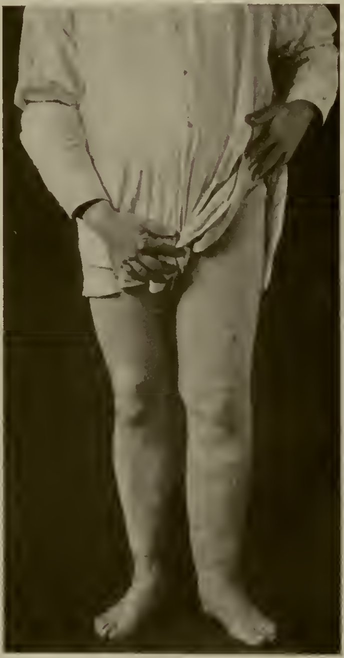

Fig. 372.—Front view of patient after operation. The leg is much reduced in size. The location of the thread is indicated by the series of scars visible on the leg and thigh.

The immediate result of this operation with the introduction of two threads was, as you see (Fig. 372), a considerable reduction in the size of the limb. In order to keep the limb from expanding too much during his very hard work a leather shoe or, rather, brace was made which passed around the whole limb from below clear to his hip, and was laced, so that he was comfortable when wearing it. After a short time, however, the patient felt so well that he discarded this, and although there is some swelling, more than is shown in Fig. 372, the limb remains very much smaller than it was before the operation, and there is no doubt that circulation of lymph alongside the threads has established itself, and that the final result is a considerable improvement. There are two threads introduced in this case, but it would perhaps be advantageous to pass a third thread along the entire posterior aspect which is still connected with the lower limb through the lymphatics.

CLINIC OF DR. HERMAN L. KRETSCHMER

ALEXIAN BROTHERS HOSPITAL

HYDRONEPHROSIS DUE TO KIDNEY STONE: REMARKS ON THE DIAGNOSIS AND TREATMENT OF RENAL CALCULUS

Summary: Systematic study of a case leading to the correct diagnosis; deductions as to treatment; indications for pyelography; fate of kidney stones; methods of diagnosis—their uses and limitations; indications for operation; three operative procedures available—the indications, advantages, and disadvantages of each; treatment of hemorrhage.

MRS. R. P. D., age fifty-four, referred by Dr. John McClellan. At present her only complaint is pain in the left side. The patient has been troubled with this pain off and on for the past twenty years. The first time she noticed this left-sided pain was in 1896. The pain was present then for a month or more. She was then free from pain for ten years. Ten years ago she had another attack, and the attacks have been fairly frequent ever since. The last attack began three weeks ago. At this time the patient worked harder than usual and thinks that this brought on the attack. The pain is of a dull, throbbing character in the left lower quadrant of the abdomen. The attack lasts about a month, and then she is free from pain for three to five months, when another attack comes on. The patient states that the pain is always located to the side and sometimes in front. Certain positions seem to make the pain worse, but what positions she is unable to state. She always sleeps on the left side to prevent an attack of pain. The pain is not distinctly worse at any part of the day. There is no accompanying nausea or vomiting. The patient has never found anything that will stop the attacks except massage. Such treatment will stop the pain, and at one time there was no recurrence for five months. Never had abdominal cramps or blood in the urine and only very recently has she had nocturia. Associated with these attacks of pain is a feeling of depression. She has some gastric distress and has a great deal of gas and rumbling, associated with soreness in the epigastrium. Otherwise her history is negative.

General physical examination is negative. Examination of the abdomen: On palpation a tumor mass is felt in the left upper quadrant. It extends $2\frac{1}{2}$ cm. beyond the midline and about 2 cm. below the level of the navel. Above it extends under the ribs. The surface is smooth and the margins are round. It is of firm consistency. The tumor mass cannot be moved about.

Cystoscopic examination of the bladder is negative. Ureteral catheterization is easy and without obstruction. The urine from the right side is clear. Microscopic examination is negative. The urine from the left side is turbid. Microscopic examination shows the presence of pus. Cultures of the urine collected from the right side have remained sterile. Cultures from the left side show a pure culture of Bacillus coli. Phenolsulphonephthalein test—Right kidney: The dye appeared in seven minutes. Output for one hour was 42 per cent. Left kidney: The dye appeared in twenty-five minutes. Output for one hour was 5 per cent. Roentgen ray examination showed the presence of multiple calculi in the renal pelvis.

Because of the presence of pus and Bacillus coli and the impaired function of the left kidney and the presence of shadows in the *x*-ray plate, it seems that the diagnosis of multiple renal calculi is perfectly clear. The only other lesion that one might have to consider with this evidence would be the possibility of calcifications in the spleen. Calcifications in the spleen are very rare and would not be associated with the previously mentioned ureteral findings. I think, therefore, that one is perfectly justified in excluding the spleen as a cause of the pain. The question might be raised why a pyelogram was not carried out. From the evidence at hand I believe one is justified in assuming that the patient has calculi in the renal pelvis and that these calculi have produced obstruction. This obstruction gives her attacks of pain, and as a result of this mechanical obstruction a hydronephrosis has developed behind the stones. It is a well-known fact that a pyelogram gives us information that, many times, one cannot obtain in any other way. It is equally important in doing a pyelography to select the cases in which the pyelography should be done. In our clinic in the Presbyterian Hospital we never do a pyelography unless we cannot make the diagnosis in any other way. I think on the evidence submitted, the diagnosis is clear and that it is not necessary to do a pyelography, and, furthermore, where one is dealing with large hydronephroses, patients tolerate pyelography very badly because of the fact that the retention of the salts used in performing a pyelography produces a general and a local reaction. Pyelography is not a method to be used indiscriminately. In some cases in which pyelography has been performed, enormous infarcts in the kidney have developed, necessitating removal of the kidney, so that this procedure is not entirely free from danger.

Under ether anesthesia, therefore, we will operate on this patient at once and will perform a nephrectomy. With a kidney the size of this one, and from the fact that she has multiple calculi, and in view of the fact that she has an infection, and because of the fact that she has a very low phthalein output, I believe we are justified in assuming that nothing of the kidney remains but a mere shell, and that to remove the stones through a pyelotomy incision, and to leave this dilated, saccular kidney behind would be a sad mistake. I think the reason why the patient obtained relief by massage is due to the possibility that the stones are movable and that with the massage the stones were moved away from the outlet and urinary drainage would be re-established, relieving her of the pain.

We will make the usual oblique kidney incision, making it longer than we usually do because of the enormous size of this kidney. The skin and deep fascia are quickly divided. The lumbar muscles are divided, no attempt being made, because of the size of the tumor, to do a muscle-splitting operation. The transversalis fascia is divided, the perirenal fat comes into view, and is incised, and the process of freeing the kidney is begun. The upper pole of the kidney is very firmly adherent to the diaphragm, so that we must proceed to break up the adhesions slowly so as not to perforate the diaphragm and produce pneumothorax. The height of this tumor can be seen by observing that my arm to the elbow is inside the wound. With much difficulty the kidney is finally freed, but before it can be delivered it will be necessary to increase the length of this incision forward. One might perhaps be able to remove this kidney without this additional incision by passing a trocar into the kidney and removing the fluid. This, however, I would not like to do because we know that this urine is infected. The kidney has been pulled into the wound and the entire pedicle

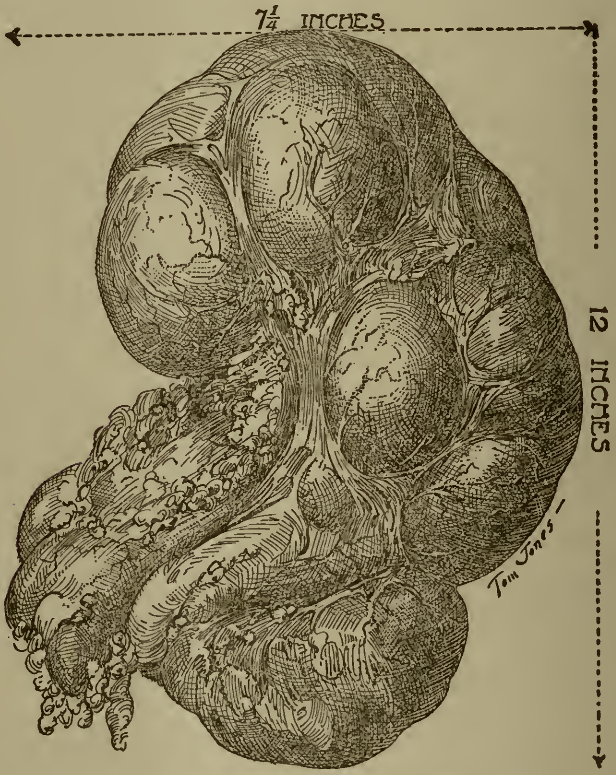

Fig. 373.—Specimen removed at operation.

ligated *en masse* in two portions. In order to ensure thorough hemostasis I shall make use of heavy silk ligatures, and no attempt will be made to separate the renal artery and renal vein. The enormous cavity which will remain will be packed lightly with gauze and a cigarette drain inserted to the stump, the muscles closed in the usual way, and the skin closed with silk.

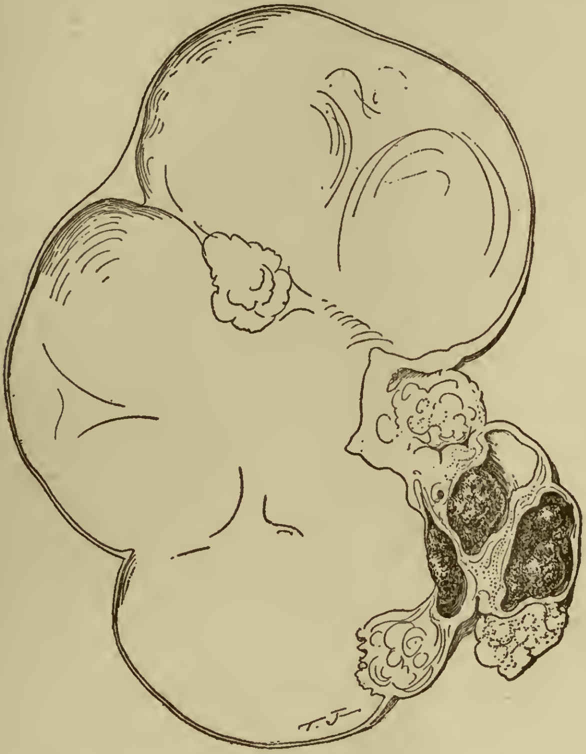

Fig. 374.—Pelvis opened to show the position of the stones.

Examination of the specimen shows an enormous kidney that measures 12 by 7 inches. The surface is very irregular and shows the presence of many large saccules, and in the pelvis of the kidney can be felt many hard stones. This specimen we will not open, but it will be immediately placed in formalin. After the specimen has been hardened it will be opened (Figs. 373, 374).

Stones having their origin in the kidney may have one of the following four terminations:

1. The stone may remain in the kidney, in one of the calices, or in the pelvis.
2. The stone may enter the ureter and in its course down the ureter become lodged therein. This usually occurs, or occurs with predilection, at one of the normal constrictions of the ureter.
3. The stone may pass from the ureter into the bladder, where it may remain and become the nucleus for a bladder stone. If a careful history is elicited in cases of vesical calculus one is often able in a certain percentage to obtain a history of a previous attack of renal colic. This may have occurred many years ago so that the patient has quite forgotten it, unless his attention is specifically called to the fact.
4. The stone may be voided by the patient.

Kidney and ureteral calculi often present many symptoms in common, so that at first one is not able to make an absolute differentiation between them. This point must often be settled by the roentgenogram, and in cases in which this is negative one may resort to other diagnostic measures.

The present high plane which has been attained in the surgical treatment of renal calculi is a more or less direct outgrowth of the accurate methods of diagnosis that are at our command. Briefly they are:

1. The roentgen ray.
2. The cystoscope and ureteral catheter.
3. The shadowgraph catheter and pyelography.
4. The functional kidney tests.

Undoubtedly, the single factor which has contributed most to the diagnosis of kidney and ureteral calculi is the *x*-ray. Its field of usefulness in this work is further enriched by the simultaneous employment of the *x*-ray and the cystoscope, made possible by the introduction of the shadowgraph catheter and pyelography.

While it may be possible in a large number of cases to make a diagnosis by means of the roentgen ray alone, there will always remain a certain number of cases in which pyelography, the shadowgraph catheter, or both, must be employed. Thus, for example, in cases of stone occurring in a pelvic kidney no positive diagnosis can be made without the employment of one or both of these additional aids.

Not only is the roentgen ray of value in the diagnosis of calculi, but it is of inestimable value in watching the progress of a calculus down the ureter. Another example in which a combination of methods is of value is illustrated in cases in which a stone in the renal pelvis or ureter does not show very plainly in the roentgenogram. If one injects into the pelvis or ureter a solution of collargol, and takes a second picture, the stone then appears very distinctly on the plate. This, as far as I know, was first recommended by Kümmell, of Hamburg.

Nor should we forget in applying the roentgen ray that the exposure should include both kidneys and both ureters. The value of this procedure is apparent when we bear in mind the frequency of bilateral calculi, as well as the possibility of the presence of a stone in one kidney and the occurrence of one or more stones in the ureter of the same or opposite sides. The value of this procedure is also apparent in cases in which a nephrectomy was performed for stone, and the patient then returns with a stone in the remaining kidney. It is of more than academic interest under such circumstances to know whether the stone was present before the first operation, or has formed subsequently.

Cystoscopy and Ureteral Catheterization.—Whereas these two diagnostic aids cannot establish a positive diagnosis in each and every case of renal or ureteral calculus, they can in a definite number of cases give us information from which a diagnosis may be made or ventured. By their employment it is possible in nearly all the cases to locate the source of the pathologic elements found in the urine, such as blood or pus, if they are present. In cases of renal stone associated with profuse hemorrhage, the origin of the blood may be determined in this way. In cases of descending ureteral stone associated with colic one may often see changes about the ureteral orifice of the corresponding side. In passing, one may also mention the use of the wax-tipped catheter. If positive information is obtained in this way one may venture the diagnosis of stone; if the result of this examination is negative, it does not exclude stone.

Functional Tests.—After the diagnosis of stone has been made and the treatment outlined, we are next concerned with the condition of and the presence of the opposite kidney. This important point deserves due consideration in each and every case, no matter how simple the operative treatment may seem. Not infrequently a simple operation is contemplated, but complications arise which end in the removal of the kidney. If the presence of the opposite kidney has been determined and its functional capacity been determined, it is a very comforting thing in those instances in which one is obliged to remove the kidney.

Of the various functional tests that have been advised, the one most frequently used is the phenolsulphonephthalein test, which has answered my purposes very well. There are many objections and many objectors to a too careful reliance and dependence upon dye tests. I believe that one should not rely upon the result of the dye test alone, but that one should include careful examination of the urine, both chemically and bacteriologically.

Indications for operation:

1. Cases in which there is a vital indication to operate. Under this one may consider cases of anuria, acute pyelonephritis, profuse hemorrhage, and conditions of retention which sooner or later lead to atrophy of the kidney.

2. Cases in which the operation must be advised, but in which there is no immediate danger as regards the life of the patient or the function of the kidney. In this group belong the cases associated with chronic pyelitis, repeated attacks of colic without the passage of stone, pain or discomfort in the kidney area, and the presence of stone in the ureter.

3. Cases in which intervention is unnecessary. In this group one may consider cases that can be treated medically. Briefly, these are cases with repeated attacks of colic associated

with the passage of small stones, in which the urine is not infected and in which the x-ray does not show large stones.

The three operative procedures in the surgical removal of kidney stone are: pyelotomy, nephrotomy, and nephrectomy.

Pyelotomy, in cases suitable for it, is a simple and safe procedure involving little or no hemorrhage, and it has the great advantage over other operations that it avoids a mutilation of kidney tissue, which always occurs to a certain extent when a nephrotomy is carried out. Pyelotomy, furthermore, avoids or prevents the occurrence of hemorrhage from the kidney into the renal pelvis, which ofttimes results in the bladder becoming distended with large blood-clots, so that the patient suffers a great deal of pain and one has a lot of trouble in freeing the bladder of these clots. The essentials for success in pyelotomy are:

1. In selecting cases for pyelotomy we should be guided by the results of the roentgen ray examination and possibly by the pyelographic findings.
2. Limiting its use to pelvic stones.
3. Employing pyelotomy in cases in which there is no infection present, or infection of mild degree.
4. One should be able to deliver the kidney.
5. Avoiding unnecessary trauma to the pelvis.
6. Prevention of injury to the blood-supply of the kidney pelvis.

Before incising the pelvis the peripelvic fat should be carefully separated. Occasionally an accessory pelvic vessel may be present, and unless this is recognized and avoided the patient may have a certain amount of hemorrhage. Great care should be used in performing pyelotomy not to tear the renal pelvis, not only because of the danger of hemorrhage but also because large and irregular tears of the renal pelvis have been followed by persistent sinus formation. Because of the more or less limited field of operation it is particularly desirable before closing the incision in the pelvis to be sure that the stone removed is intact and that no fragments have been left behind.

Nephrolithotomy.—In cases in which the stone is too large to be removed through the pyelotomy incision, or where the stone or stones extend into the calices, branching in various directions, in instances where the pedicle is very short and where there is a good deal of perirenal inflammation so that the kidney cannot be delivered into the wound, one must resort to nephrolithotomy. There are instances in which one starts out to do a pyelotomy, which, judging from the roentgenogram, would be the correct procedure, but one or several of the above-mentioned conditions are found, so that nephrolithotomy is the only course open. At times it may even happen that one must remove a calculus with the kidney remaining *in situ*.

After the kidney has been delivered into the wound it should be carefully palpated for the presence of stone. That is, the stone should be definitely located before cutting into the kidney. This may not always be possible in the cases of very small calculi, yet when possible it should be done. Palpation of the renal pelvis can be carried out at the same time.

In cases where the stone is seen in the *x*-ray, but cannot be felt, some surgeons are in the habit of needling the kidney. This procedure is advised by some and condemned by many chiefly for the reason that if a hard nodule is felt and if it be a calculus it must be cut down upon anyway. If nothing is felt by needling no one would be satisfied with the limited information obtained in this way, so that exploration must be resorted to anyway.

If the calculus can be felt in the substance of the kidney it should be exposed by an incision either on the convex border of the kidney or, if the stone is near the anterior or posterior surface of the kidney, it may be cut upon directly.

The nephrotomy incision is usually made in the convex border a little nearer the posterior portion of the convexity than the anterior, as there is less danger of injuring the vessels. After the incision has been made the interior may be examined with the finger or the calculus may be directly removed with the aid of the forceps. The stone must be carefully examined to ascertain whether or not it is complete, whether or not facets are present, so that calculi may not be overlooked.

The further treatment of the nephrotomy wound will depend upon several factors, chief of which is the presence or absence of infection. When infection is present it is often advisable to insert a tube for drainage, although this procedure has been criticized because of the hemorrhage which it may produce.

Hemorrhage is one of the more important complications following nephrotomy, and has often proved so serious that a secondary nephrectomy became necessary in order to save the life of the patient. When the hemorrhage occurs at the time of nephrotomy it can usually be controlled. This may be done by grasping the pedicle in order that one may make an inspection of the field. Occasionally a spurting artery is seen that can be caught with the forceps. Often, when the hemorrhage seems to be due to a general oozing, it may be controlled by hot pads. As a rule, the sutures which close a nephrotomy incision suffice to control the bleeding.

The bleeding that makes one feel absolutely helpless is the continued postoperative hemorrhage. As previously mentioned, the bleeding continues, the hemoglobin goes down steadily, the patient's mucous membranes become pale, and one must resort to nephrectomy in order to save the life of the patient. Under these circumstances one always feels more comfortable if the status of the kidney which remains has been definitely determined before operation.

URETERAL CALCULUS: REMOVAL BY INTRA-URETERAL INJECTIONS OF OIL

Summary: Differential interpretation of *x*-ray plates; evolution of the treatment for ureteral calculus; conservatism the keynote of present-day methods; demonstration of 2 cases.

One of the most satisfactory diseases of the urinary tract the surgeon is called upon to treat is ureteral calculus. This present satisfactory treatment is due to several factors, the chief of which are our ability to accurately diagnose this condition, and the large number of cases that can be treated without resorting to the open operation. The early work in this field was seriously handicapped by frequent misinterpretation of the roentgen-ray findings. Many patients with severe abdominal pain were examined by the roentgen ray, a shadow or multiple shadows were seen that were erroneously interpreted as being due to ureteral calculi, and the patients were operated upon and no stones found. Later, with the introduction of the shadowgraph catheter, it was shown that many of these bodies were situated outside of the ureter; that is, when these patients were *x*-rayed with the shadowgraph catheter in the ureter it was seen that the catheter passed at some distance from the so-called stone. In this plate (Fig. 375) it can be seen that the catheter passes at some distance from the shadow. By this simple procedure we can definitely state that the shadow is of extra-ureteral origin, and hence cannot be due to a stone in the ureter. These shadows may be produced by various conditions and are not always due to the same cause. Among the more frequent causes of obscure shadows in the pelvis may be mentioned calcification of the ligaments, calcified lymph-nodes, plaques in the arteries and veins, phleboliths, and areas of calcification in the seminal vesicles or broad ligaments. In some instances these shadows have been produced by pills that were ingested by the patient,

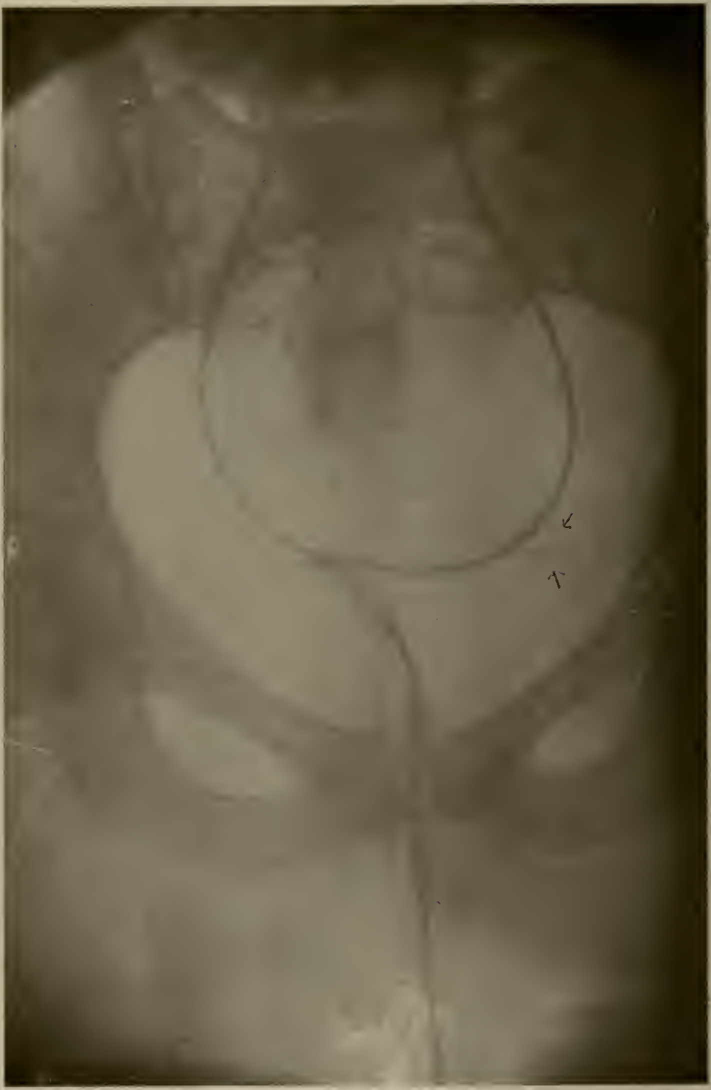

Fig. 375.—Note the interval between the catheter in the ureter and the suspected ureteral calculus.

so that it is very important in cases of this kind, where the least doubt may exist about the location of the shadow, that the shadowgraph catheter be introduced and an *x*-ray taken with the catheter *in situ.* This simple procedure will often save the surgeon from getting into an embarrassing position and the patient from unnecessary operation.

It is generally believed that when a stone is present in the ureter obstruction to the catheter is necessarily present, but that this is not always true is illustrated by the first case that I wish to present, where obstruction was met at one catheterization, and at the second catheterization the catheter passed into the pelvis of the kidney without trouble.

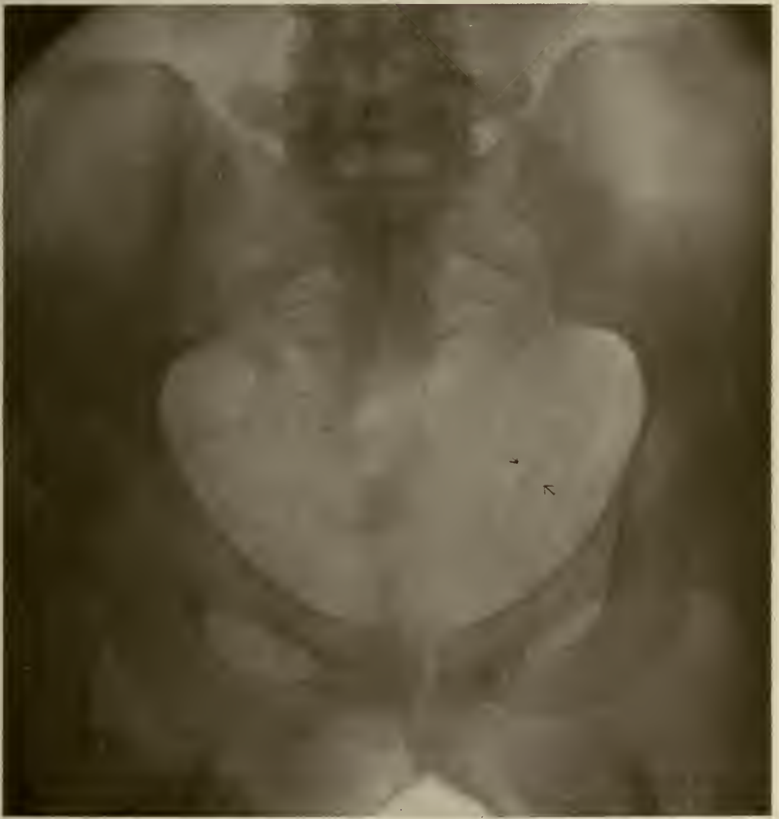

Fig. 376.—Note position of the stone.

Undoubtedly the largest number of ureteral calculi are passed spontaneously by the patient, a fact which should always be borne in mind when considering surgical treatment. Formerly, all those patients in whom a diagnosis of ureteral calculi was made were operated upon. Now, as is well known, they are not operated unless other measures fail.

The treatment of ureteral calculi in a general way has passed through three stages: The first stage may be represented by the period immediately after the introduction of the roentgen rays. At this time many now well-recognized extra-ureteral shadow-producing bodies were erroneously diagnosed as calculi and the patients unnecessarily operated upon. The second stage may be represented by the period immediately following the introduction of the shadowgraph catheter, by means of which more accurate diagnoses were made and the number of unnecessary operations was very greatly reduced. The general consensus of

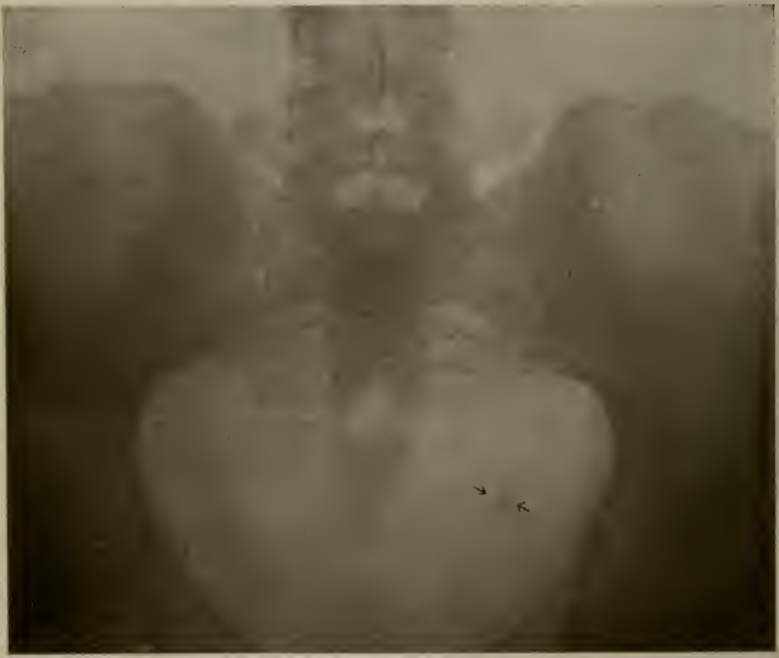

Fig. 377.—Note position of stone. It will be seen by comparing with Figure 376 that the stone has been turned around on its long axis.

opinion during this time was that the treatment of ureteral calculi was surgical, and the operation usually employed was the extraperitoneal ureterotomy. The third period may be represented by our present-day views, and is characterized by the swing of the pendulum in the opposite direction, so that at the present time the keynote in treatment is conservatism. *In other words, one resorts to operation only after a prolonged, careful, and conscientious use of non-operative measures fails to accomplish removal of the stone.*

As an example of what can be accomplished by the non-operative treatment I wish to present the following cases. The first has been relieved of the stone by oil injections and the second is still under treatment.

CASE I. Miss C. G., aged twenty-four, complains of pain in the sacral region and in the lumbar region, pain in the right side of the abdomen, nausea, and vomiting. The patient dates the onset of her present complaints back one and one-half years, previous to which time she felt perfectly well. During the night she had sudden, severe, sharp pain in the right lumbar region, radiating toward the right inguinal region. The pain lasted for an entire day and part of the next night and gradually disappeared. During the attack of pain she had reflex nausea and vomiting, and there were associated chills and fever, but there was no jaundice or hematuria. The pain was so severe in character that she received a hypodermic injection.

She had a second attack three months later similar in all its essentials to the first attack. In all she had about ten attacks, the last one occurring ten days ago.

General physical examination was negative. Roentgen-ray examination showed the presence of a stone low down in the pelvis. The stone has an **L** shape, and from the history and from the roentgen-ray plate a diagnosis of stone in the right ureter was made by Dr. Bevan, to whose service the patient was admitted at the Presbyterian Hospital. Dr. Bevan referred her to me for treatment before considering surgical intervention.

Cystoscopic Examination. February 13, 1917: Right ureteral orifice appears edematous, the edema being in front of the ureteral opening. The ureteral orifice was slit on the upper surface by means of the operating cystoscope and a ureteral catheter passed as far up as possible and 10 c.c. of sterile oil injected through the catheter.

February 15, 1917: Attempt made to catheterize right ureter. Catheter meets an obstruction about 5 cm. behind stone. Injection of 10 c.c. of oil.

February 23, 1917: Right ureter catheterized. Catheter passed up into the pelvis and 10 c.c. of sterile oil injected.

March 8, 1917: Another injection of oil. Attempt was made at this time to grasp the stone with forceps, but failed.

March 16, 1917: Catheterization of right ureter and injection of 10 c.c. of sterile oil.

March 18, 1917: The patient passed a large stone.

During these injections of oil the roentgen-ray pictures that I show you were taken. In one picture the stone is completely turned around, which can be seen by looking at the accompanying plates. A well-known fact was brought out in this case, namely, that with a case of ureteral stone one does not expect to find an obstruction to the passage of the catheter. In this case, for example, about one-half the time the catheter would lodge in the ureter, or better, perhaps, was obstructed in its passage up the ureter by the stone, while at other times the catheter was passed without difficulty.

Case II. Mr. F. G., referred by Dr. McCulloch, was first seen by Dr. McCulloch on the 5th of May. About 1 o'clock that day he began to have pain on the left side, which was dull at first and later colicky in type. This pain radiated along the course of the ureter and down into the scrotum. The pain was dull in character and at no time was severe enough to have an anodyne. At 6 p. m. he had a severe chill and his temperature began to rise. The alternating periods of chills, fever, and perspiration continued for forty-eight hours and he was taken to the hospital. During this time the output of urine was scanty, only 600 c.c. in twenty-four hours.

Previous History.—Fourteen years ago he had an attack of ptomain poisoning, and ever since he has had these attacks at varying intervals. In 1906 he saw Dr. Frank Billings. At that time there was no stone in the urinary tract and a diagnosis of pyelitis was made. In 1907 he again had a severe attack lasting six weeks, during which time he had several attacks of hiccup, one of which lasted for four days. Seven years ago he passed a stone.

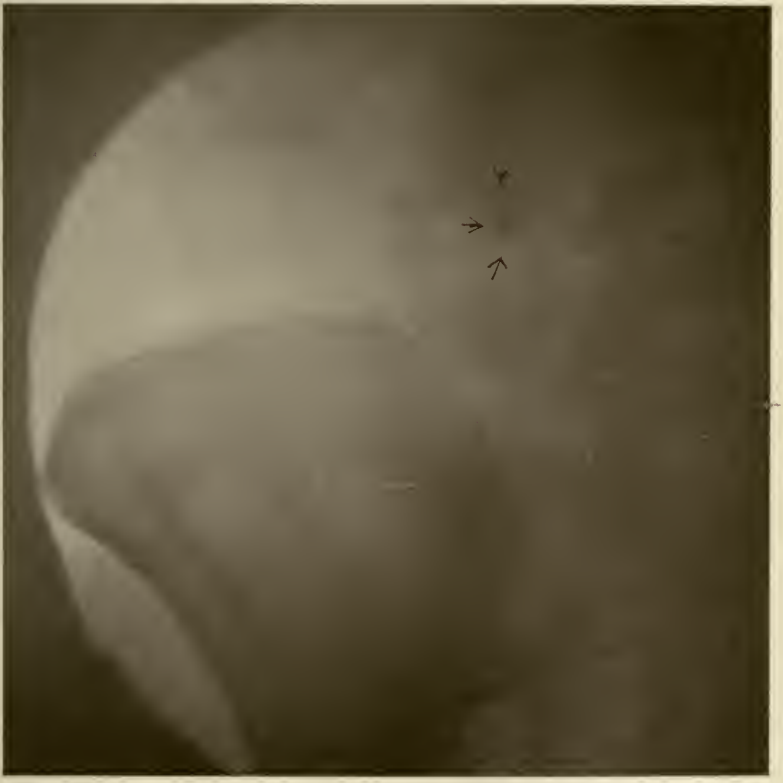

Fig. 378.—Stone in ureter before intra-ureteral injection of sterile olive oil.

Examination shows a middle-aged man, well nourished and with good color, who is apparently suffering considerable pain. The pupils are equal and react to light and accommodation. Teeth are fair. Heart normal, tones clear and regular. Lungs negative. There is considerable tenderness over the region of the left kidney and ureter. Blood-pressure is 135 systolic and 90 diastolic.

Blood-count shows 28,000 whites. Temperature is 103° F. Urine examination: Turbid; albumin present; also red blood-cells and pus.

Roentgen-ray examination: This shows the presence of a shadow compatible with that of a stone in the ureter situated at the level of the fourth lumbar vertebra (Fig. 378).

From the history, physical findings, and *x*-ray findings a diagnosis of stone in the ureter was made, and it was decided to treat the patient by injections of oil into the ureter.

May 7, 1917. Cystoscopic: Patient was cystoscoped with the operating cystoscope. The left ureteral orifice is normal except that it appears to be very small. The operating scissors were introduced into the ureter and the mouth of the ureter slit. The catheter was passed until the obstruction by the stone was met; 20 c.c. of sterile oil were injected.

Since his first treatment the patient has had a rather stormy time. He became very toxic, had a chill of twenty minutes' duration, a temperature of 103° F., and at times was somewhat irrational. The hiccup continued for several days, so that no instrumentation was carried out until the 21st.

A roentgen-ray taken May 19, 1917, or twelve days after his first treatment, showed the calculus to have wandered down the ureter so that now it rested at the level of the second sacral foramen (Fig. 379).

May 21, 1917: 15 c.c. sterile oil injected into the pelvis of the left kidney. This time the catheter passed all the way up the ureter into the kidney pelvis, again demonstrating that a good-sized stone may be present in the ureter without producing any obstruction.

A third roentgen-ray picture shows the stone 1 inch farther down the ureter.

May 23, 1917: The patient was given another injection of 30 c.c. of sterile oil.

The technic of these procedures consists in the use of intravesical manipulations with the cystoscope. These procedures, briefly considered, are: first, dilatation of the ureteral orifice either with a catheter or with a ureteral dilator in order to stretch the ureteral orifice so that the stone may be allowed to pass. Where this fails, and sufficient dilatation cannot be obtained, the ureteral orifice may be enlarged by slitting it with the scissors. In cases where the stone is smaller and situated high above the bladder in the ureter we may try to dislodge the stone by the ureteral catheter. This may be followed by intraureteral injections of a local anesthetic followed by the injection of oil. To aid in dilating the ureter, injections into it of a solution of papaverin has been advised.

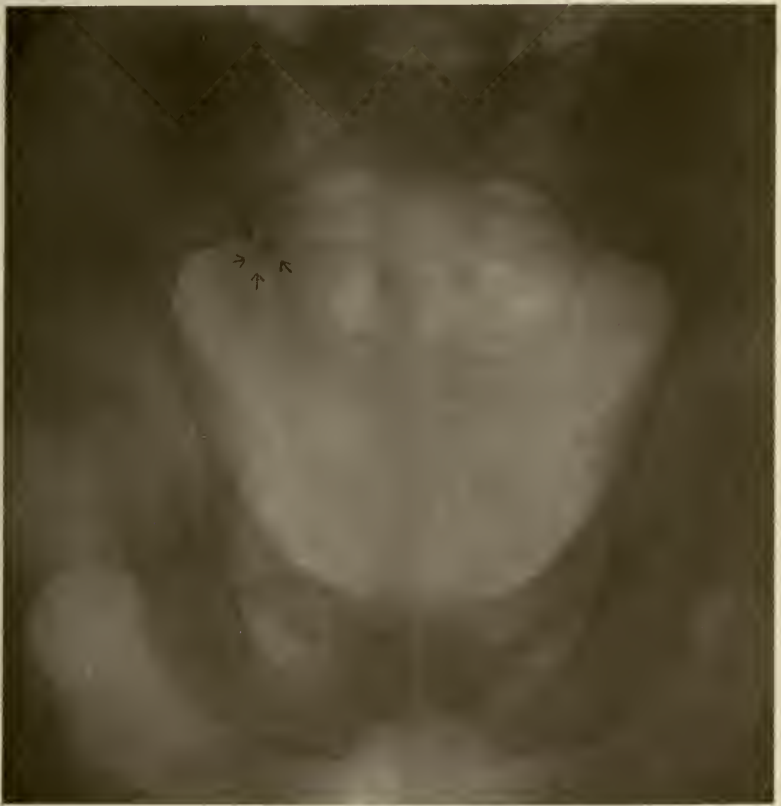

Fig. 379.—Showing position of the stone after the first injection of oil.

In view of the fact that a large number of stones are passed spontaneously, patients should first be given medical management, this to consist of the drinking of large quantities of water, moderate catharsis, and general hygienic treatment. If this fails, then one is justified in advising the use of the ureteral catheter. If many repeated attempts by this means fail to relieve the patient, then, and only then, is one justified in operating. In other words, operative treatment should be the last resort. I cannot tell you off-hand the number of cases of stones that we have had in our clinic that have been treated in this way, but I should say that the percentage that we operate upon is not over 4 or 5, whereas formerly they were all operated upon. It is surprising how large a stone can be removed in this way by simply slitting the ureter, passing up a large catheter to dilate the ureter, and then injecting oil.

In conclusion, therefore, I believe that one is justified in making many attempts to remove the stone by means of ureteral catheterization, the operating cystoscope, and injections of oil, etc., and then only after repeated attempts have failed is one justified in performing a ureterolithotomy. While ureterolithotomy if carried out by means of extraperitoneal dissection is relatively an easy procedure and has practically no mortality, still every once in a while a patient following ureterolithotomy develops ureteral stricture, infection, destruction of the kidney, and death.

CLINIC OF DR. THOMAS J. WATKINS

St. Luke's Hospital

CYSTOCELE, UTERINE PROLAPSE, RETROFLEXION, AND RECTOCELE REPAIRED BY PLASTIC OPERATION UPON BROAD LIGAMENTS AND VAGINA; FIXATION OF THE ROUND LIGAMENTS AND ADVANCEMENT OF THE ANTERIOR VAGINAL WALL; PERINEORRHAPHY

Summary: History of patient illustrating many of the late symptoms and signs incident to the traumatism of labor; relation of the symptoms to the physical signs; method of procedure for correction of the pathologic changes—technic in detail.

HISTORY

Mrs. L., aged thirty-seven, married eleven years, weight 149 pounds.

Family History.—Negative.

Past Illnesses.—Always well except for some attacks of nervous exhaustion.

Present Illness.—Dates from birth of child nine years ago, which was a difficult labor. Her symptoms have been distress on walking and standing, the distress consisting in a feeling of weight in the pelvis, backache, and general fatigue. She also has much mental depression. The distress is more marked upon the left side of the pelvis than the right, probably due to varicose veins in the broad ligament.

Menstruations are normal, except for some increased amount of flow. Vaginal discharge slight.

Vesical Symptoms.—Partial incontinence of urine.

Bowels.—Constipated.

Physical Examination.—General condition of patient excellent.

Pelvic Examination.—Perineum is much relaxed. There is a pronounced rectocele. The urethra is displaced downward and has an increased amount of mobility. It can be pressed upward about $\frac{1}{2}$ inch, which represents the amount of urethrocele. There is considerable bulging of the bladder wall into the vaginal canal (cystocele). The cervix is $1\frac{1}{2}$ inches from the vaginal orifice, which in this case indicates a prolapse of the uterus, as the cervix is about the normal length. The cervix is lacerated bilaterally, but not deeply, and this is of no special pathologic importance. The uterus is in retroposition. The body of the uterus is easily palpated in the posterior vaginal fornix. Bimanual palpation shows the uterus displaced backward and one and one-half to twice its normal size. Both ovaries are palpable, normal in size, and freely movable. The free mobility indicates that there has been no salpingitis, as in a case of salpingitis the ovaries are almost invariably fixed by adhesions. The uterus is easily replaced.

PATHOLOGY

The pathology in this case is entirely the result of the traumatism of labor. There is no history or sign of infection. The levator ani muscle has been considerably attenuated and separated from its attachment to the pubic ramus, thus allowing the perineum to drop downward and backward. This has increased the separation of the levator muscles near the median line and a hernia of the rectum has resulted (rectocele). The urethra was crowded downward in front of the child's head and some of its points of attachment were torn and stretched, and it has never recovered its normal location and position. The fascia in the vesicovaginal septum was torn and overstretched, and has resulted in a hernial opening through which a portion of the bladder protrudes (cystocele). The injuries to the pelvic floor allowed the uterus to sag in the pelvis, and in sagging the cervix followed the vaginal canal, and, as a result, the uterus in passing around the "uterovaginal angle" tipped over backward into the position of retrodisplacement. The increased size of the uterus is the result of the prolapse and retroflexion. This has obstructed the venous circulation, and as a result the uterus has become engorged with venous blood, edematous, and hyperplastic.

RELATION OF SYMPTOMS TO PATHOLOGY

The distress on walking and standing can be attributed to two causes: First, the varicosity of the pelvic veins, which is often very marked in such cases as this one; and second, the sprain of the pelvic supports, chiefly of the uterine ligaments. Manipulation of the uterus shows the ligaments to be hypersensitive. This can be proved by traction upon the cervix or upward pressure upon the cervix. Palpation of the uterosacral ligaments shows them to be hypersensitive. The backache is probably the result of the sprained uterine ligaments and partly the result of general fatigue due to the pelvic disturbances. The control of the urine is somewhat impaired by the displaced urethra.

The treatment proposed is operative. Non-operative measures would only give a moderate amount of temporary relief. The principle of the operation proposed is to restore the position of the uterus by vaginal fixation of the round ligaments and by shortening a portion of the broad ligaments, and by tipping the body of the uterus forward so that the cervix will be displaced upward and backward. The hernial opening of the cystocele will be closed partly with the round ligaments and partly with the excised portion of the broad ligaments and by "circular sutures," to be described later. The urethra will be restored and fixed to its normal location by vaginal attachment of the round ligaments and by "circular sutures." The rectocele will be repaired by perineorrhaphy: operative procedures which do not endanger future pregnancies or labors.

OPERATIVE TECHNIC

The buttocks and vaginal canal are freely painted with one-half strength tincture of iodin. As soon as this is dried it is removed with alcohol. A speculum is inserted and the cervix drawn down with bullet forceps to ensure complete disinfection of the vaginal canal. Otherwise some folds of the mucous membrane are almost certain to be skipped, which might seriously impair healing.

The cervix is dilated with Hegar sounds, which are dipped in iodin. The cervix dilates easily and the uterus is $\frac{1}{2}$ to 1 inch

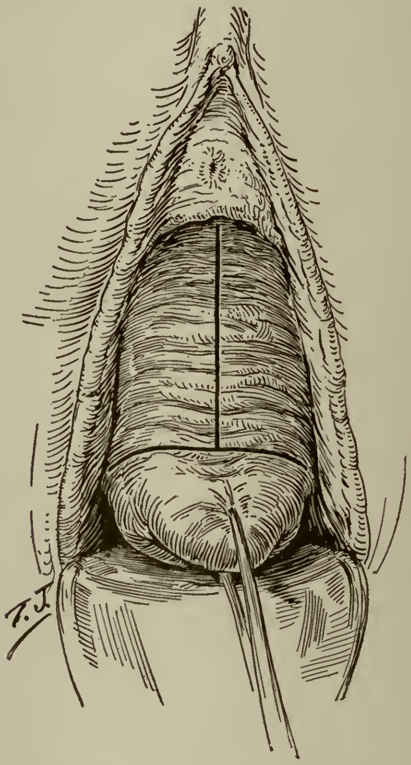

Fig. 380.—Lines of incision to be made during the progress of the operation.

increased in depth. The curet shows a normal mucosa; the thickness of the mucosa corresponds to the menstrual cycle.

Figure 380 shows the lines of incision to be made during the progress of the operation. A transverse incision is now made anterior to the cervix, extending freely from one side to the other (Fig. 380). It is important that this be a long incision, so as to permit the uterus to tilt freely upon its axis as the operation progresses (Fig. 381, 1). The cut edge of the vaginal wall is grasped on either side and the vagina is separated from the bladder by blunt dissection with a Mayo scissors, as shown in Fig. 381, 1. Care is exercised that this dissection be made along the plane of the fascia which separates the vagina from the bladder. With a little care and experience this is easily accomplished. The blunt dissection extends down to the base of the urethra. The vaginal flap is now incised in the median line to the urethra, and the hypertrophied mucosa, which is nearly always present over the body of the urethra, is excised. If this is left, it is sure to protrude and annoy the patient. Lateral separation of the flaps is now made to the desired extent, which should completely free the herniated portion of the bladder, but should not injure the ureters or the large veins.

Separation of the Bladder from the Cervix.—The plane of fascia which separates the bladder from the cervix is detected with a small amount of care, and the blunt dissection here also is done with Mayo scissors, care being taken that the point of the scissors is continually directed toward the cervix away from the bladder, as depicted in Fig. 381, 2. This dissection is continued until the tissue over the uterus is freely movable on palpation with the finger, which means that the fascia which unites the bladder to the cervix has been completely separated and that the peritoneum alone moves between the finger and the uterus. The width of this separation is made sufficient to allow the body of the uterus to be easily tilted into the vagina. The base of the broad ligament is clamped on either side with 8-inch forceps and the portion of the broad ligament between the forceps and the cervix is incised, as illustrated in Fig. 381, 3. This also shows the bladder elevated with a retractor, and completely separated from the cervix except by its peritoneal attachment. These forceps are left on to facilitate the plastic work upon the broad ligaments which will be done later.

Incision of the Peritoneum and Exposure of Round Ligaments.—The bladder is elevated with retractors and the peritoneum is exposed. The peritoneum is grasped with tissue forceps and readily incised. Figure 381, 4 shows the peritoneum

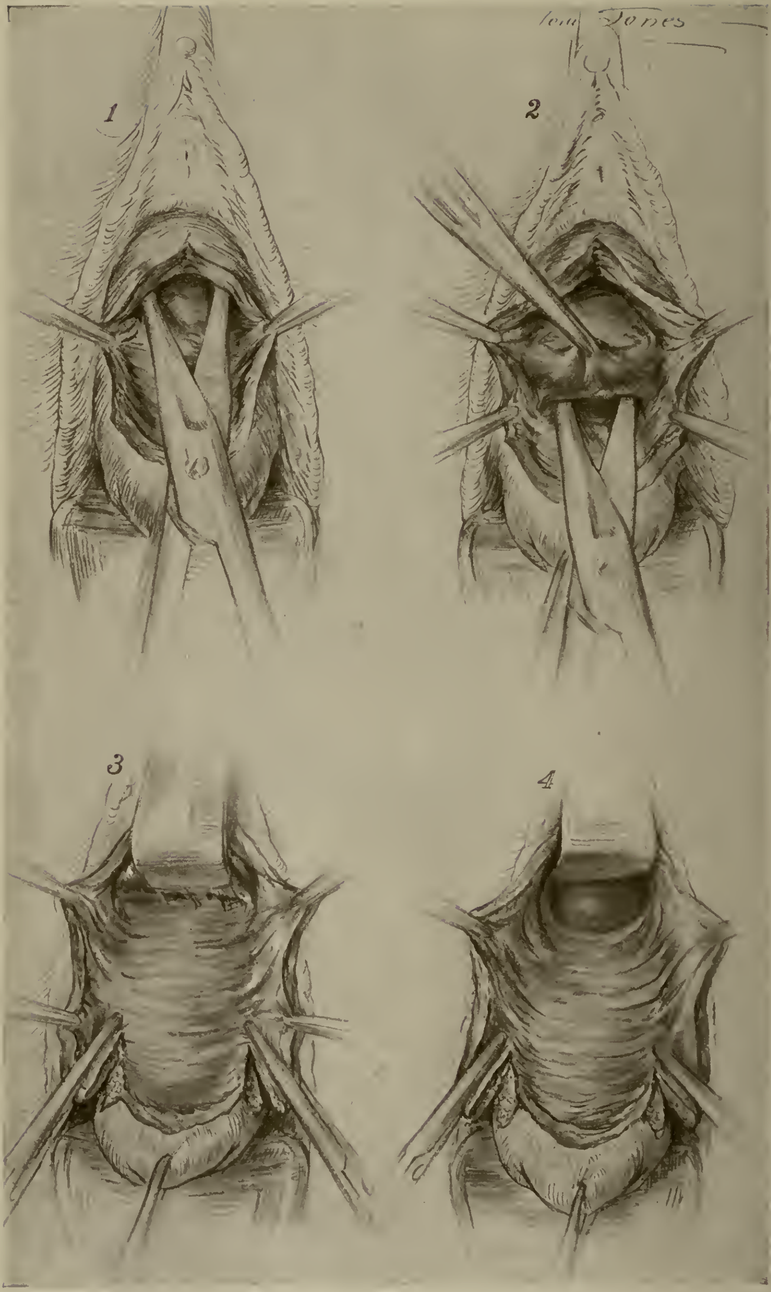

Fig. 381.

incised and a portion of the peritoneal surface of the uterus exposed. The opening is stretched with the fingers. The body of the uterus is now grasped with bullet forceps successively at points higher and higher until the fundus is reached. Now the uterus is readily delivered into the vaginal canal, as illustrated in Fig. 382, 5. Palpation and inspection show the ovaries and tubes normal. The round ligament is now found and grasped about $1\frac{1}{2}$ inches from its attachment to the uterus and is held with Allis forceps. The same is done with the other round ligament. The body of the uterus is now replaced in the abdominal cavity (Fig. 382, 6).

Fixation of the Round Ligaments.—How this is done is important, as it materially determines the result. Care is taken that each suture is placed at a point which will permit the loop of the ligament to be brought to the vagina without too much tension. The distance this point is from the uterine attachments will vary in individual cases. It should be such as to put the entire round ligament on about the same amount of tension. It should be fixed as low down in the vaginal incision as possible without excessive tension. Excessive tension means increased postoperative pain, with a possible stretching of the line of union. The fixation should be made firmly to the submucous connective tissue, and should be placed so that when the sutures are tied the urethra will be drawn upward to a place of relative fixation. This is certain to correct the urethrocele and to restore completely the control of urine. The fixation is made with fine linen or silk. Any hypertrophied mucosa present over the body of the urethra is now excised and sutures inserted as shown in Fig. 382, 6 and 7.

Insertion of the Circular Sutures.—The remaining redundant tissue in the vaginal flaps is now excised. The amount excised should allow easy coaptation without undue tension. The repair is made over the body of the urethra with fine catgut. The first

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Fig. 381.—1, Separation of bladder from vaginal wall. 2, Dissection which frees bladder from cervix. 3, Broad ligaments incised and bladder well retracted preliminary to going through peritoneum. 4, Peritoneum opened and anterior surface of uterus exposed.

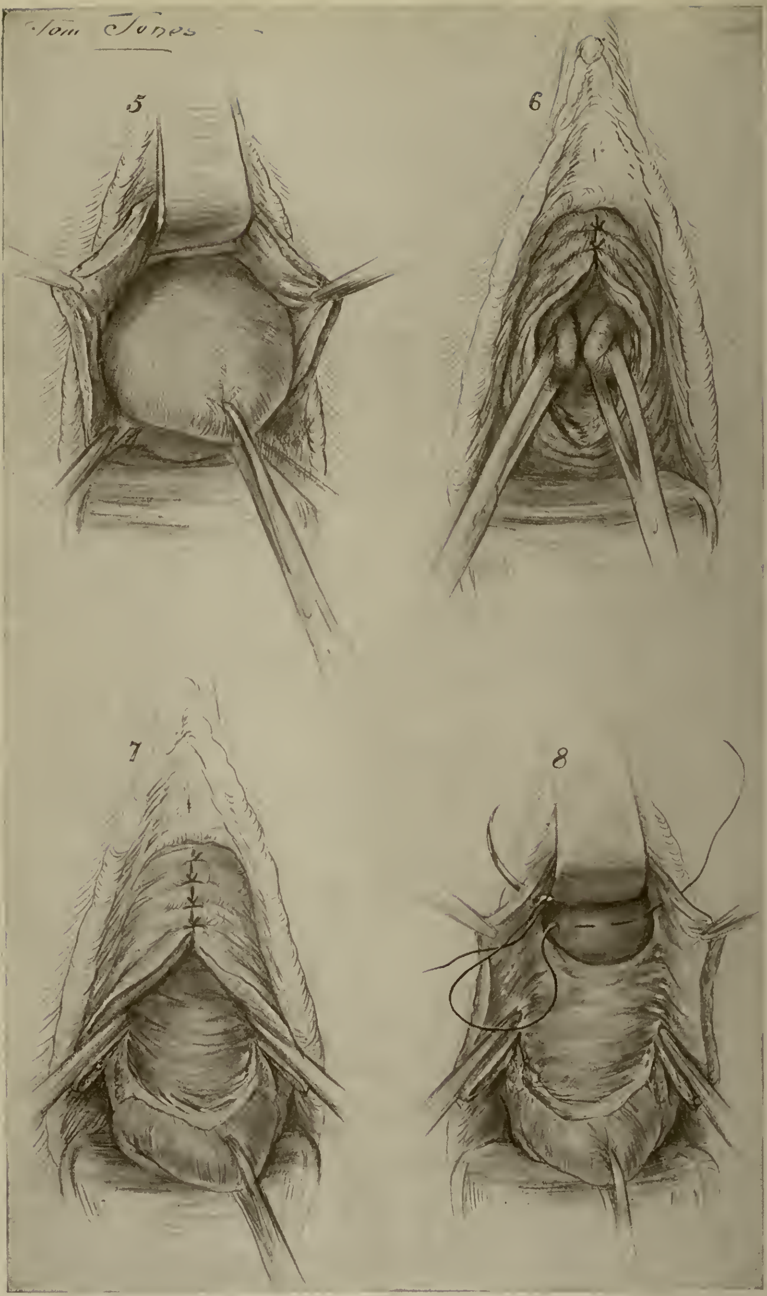

Fig. 382.—5, Body of uterus drawn through incision, so that round ligaments may be grasped. 6, Uterus replaced within abdomen and round ligaments held by forceps. 7 and 8, Steps in closure of incision; uterus included in first stitch.

circular suture passes through the vaginal wall near the base of the urethra and passes through the body of the uterus about $\frac{1}{4}$ inch above the reflection of peritoneum, and out on the opposite side through the corresponding portion of the other vaginal flap (Fig. 382, 8). This should include completely the submucous connective tissue. When this is tied, the hernial opening of the bladder is entirely closed. This should also be placed so that undue tension will be avoided and the urethra will be held in normal location. A second circular suture parallels the first one, about $\frac{1}{4}$ inch distant from it. The rest of the vaginal wound is now closed with No. 1 catgut, each suture passing through the anterior wall of the cervix. The anterior lip is excised by a V-shaped incision, as illustrated in Fig. 383, 9.

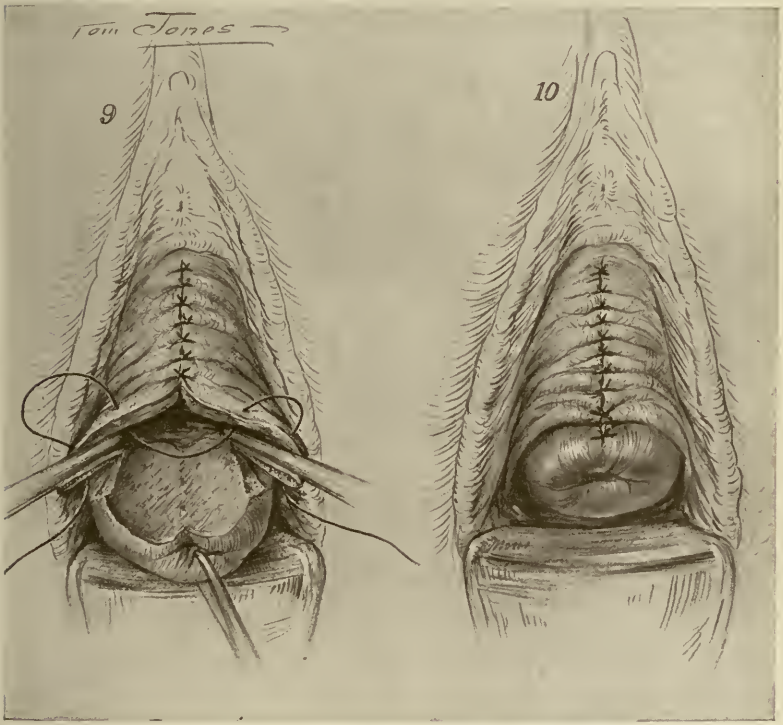

Fig. 383.—9 and 10, Steps in closure of incision; suture of vaginal flaps and V-shaped opening in cervix.

Figure 383, 9 also shows the method of suture used to unite the cut ends of the broad ligaments together in front of the cervix. In cases of extensive displacement the broad ligaments should be sutured separately with buried fine linen or silk.

Inspection now shows the urethra relatively fixed and a convexity at the site of the cystocele, the cervix well tilted upward and backward, and the vaginal canal about $3\frac{1}{2}$ inches long (Fig. 383, 10).

The operation is completed by a perineorrhaphy, the technic of which was described in a previous clinic.

RADIUM IN HEMORRHAGE AT THE MENOPAUSE

Summary: Two cases of hemorrhage at the menopause treated with radium; how radium produces results; technic of application of radium—the limits of safety—disturbances following its use.

This patient is interesting, as the condition which she presents is quite common and can be treated with great certainty of cure by the use of radium.

Mrs. F. J. U., aged fifty, consulted me in June, 1910, relative to excessive menstruations and pelvic distress. She had retroversion of the uterus, which was about one and a half times normal size. The perineum was lacerated. She was operated on by me in June, 1910. The uterus was cureted, anterior vaginal fixation was made, and perineorrhaphy performed. The results were satisfactory except that the increased menstruations have persisted.

On March 20, 1917, she consulted me again for the excessive menstruations. She was bleeding more than half the time, and the loss of blood had reduced the hemoglobin to about 40 per cent. The uterus had remained enlarged and was one and a half to twice larger than normal. The ovaries and tubes were apparently normal.

On March 31, 1917, she was given nitrous oxid anesthesia and the uterus was explored and cureted, showing an apparently normal endometrium; 50 mg. of radium were inserted into the uterine cavity. The radium was screened with 1 mm. of gold, covered by rubber. It was left in for twenty-four hours. Microscopic examination of the scrapings showed no malignant change. She experienced slight nausea for about forty-eight hours, with very little vomiting, and apparently had some exhaustion for a few days as a result of the radium. She flowed moderately for about one week after the radium was used.

On April 12, 1917, examination showed the uterus somewhat lessened in size, no recurrences of the bleeding, and her general condition considerably improved.

On April 19, 1917, she had a very slight menstrual discharge.

June 16, 1917: There has been no more bleeding. The uterus is well atrophied and her general condition is excellent.

The diagnosis in the above case is hemorrhage of the menopause, the pathology of which has not been definitely determined. The opinion is becoming somewhat general that these hemorrhages are due to disturbances of the secretion of the ductless gland due to menopause changes. This means that less importance is attributed to the senile changes in the vessels which occur at the menopause than was formerly the custom. This case is presented because it is a typical case of hemorrhage at the menopause with the usual result of radium treatment.

Action of Radium.—In this case the effective action of radium was probably due to destruction of the graafian follicles; that is, the ova were destroyed. The radium also produced definite changes in the endometrium and in the blood-vessels of the uterus. The radium lessens very much the amount of epithelial tissue and increases the amount of connective tissue. It causes the epithelium to be replaced by connective-tissue cells. It also obliterates small blood-vessels.

Technic of Application.—An anesthetic is necessary, as the screening makes the capsule so large that it is difficult or impossible otherwise to insert it into the uterus. The radium element is in a small glass capsule. This is enclosed in a small silver capsule, and this is placed inside of a gold capsule, which is covered by rubber, to which a strong silk cord is attached to guard against losing the radium. It is sterilized by immersion in carbolic acid and alcohol and dipped in tincture of iodin before being inserted into the uterus. The usual aseptic care is exercised to prevent infection. The uterus is cureted for diagnostic purposes. Small polypi and hypertrophied tissue may be found with the curet and removed with benefit.

Dosage: Limits of Safety.—Sufficient experience has been obtained to make it very safe to use radium under certain restrictions. With the screen given above there is apparently no danger of burning the inside of the uterus with 50 mg. left in for twenty-four hours, that is, with 1200 mg. hours. Experience has shown that 1000 to 1500 mg. hours inside of the uterus produce little disturbance with proper screening.

Systemic Effects.—It is rather difficult to determine how much these are, as symptoms often follow the procedures which are employed in conjunction with radium, namely, the preoperative use of morphin and the gas anesthesia. Nausea and vomiting are undoubtedly occasional results, and it is quite common to have some feeling of exhaustion for two or three days following the application. These symptoms probably depend very largely upon the amount of diseased tissue which is present and which rapidly undergoes degenerative changes. There is no pain from the use of radium more than would result from dilatation and curetage. The nausea and vomiting can possibly be somewhat lessened by the free use of alkalies before, during, and after the application. We are in the habit of giving 20 to 30 grains of bicarbonate of soda four times daily during that time. Bleeding for a few days not uncommonly follows the use of radium, and leukorrheal discharges are increased for two or three weeks. One menstrual period occasionally occurs after the use of radium. In a case like this one would feel quite certain that not more than one period would result. In such a case as this reports have shown that it is occasionally necessary to make a second application. It is well to wait for the result as regards the second menstrual period before deciding upon subsequent application. In the light of experience it is fair to conclude that some of these second applications would have been unnecessary if the patient had been kept under observation longer before subjecting her to additional treatment.

The value of radium in this case is very great to the patient, as without its use excision of the uterus would have been indicated in order to ensure a cure. Careful statistics show that thousands of cases of hemorrhage at the menopause have been so severe and persistent that hysterectomies have finally been performed.

The following case is especially interesting in this connection:

Mrs. H., aged forty-seven, suffered from *excessive* menstruations. The uterus was considerably enlarged, but apparently contained no neoplasms. She had chronic nephritis, chronic myocarditis, and a blood-pressure of 230 systolic and 120 diastolic. The amount of hemorrhage and the enlarged uterus would indicate hysterectomy if her general condition would tolerate such an operation—1200 mg. hours of radium were used, as in the other patient, with the hope that it might give relief, but with the fear that the high blood-pressure together with the heart and kidney lesions might cause failure.

It is now six months since the radium was applied and the bleeding has been entirely stopped.

I hope at a future time to give short talks on the use of radium in cases of vaginitis, endocervicitis, small fibroids in the latter part of the reproductive period, and uterine cancer.

CLINIC OF DR. DANIEL N. EISENDRATH

Cook County Hospital

THE COMPLICATIONS OF APPENDICITIS

Summary: Patient operated on four weeks before for gangrenous appendicitis with perforation near tip and abscess formation. Uneventful convalescence for first five days after operation, then severe chill followed by fever and sweat. Recurrence of chills and fever at irregular intervals accompanied by icterus and evidences of sepsis. Diagnosis of pylephlebitis due to extension of infection from veins of appendix region into radicles of portal vein within liver. Consideration of most frequent complications which may follow acute appendicitis.

I desire to present today a case which illustrates the necessity of keeping in mind the fact that cases of appendicitis which do not present any unusual features at the time of operation may develop most serious complications after operation. For this reason one can never be too guarded when asked as to the prognosis of a case of acute appendicitis.

This patient, a man of forty, was operated upon four weeks ago during my absence by one of my colleagues. He found a gangrenous appendix, with a perforation near the tip, surrounded by an abscess containing a small amount of pus. The onset and finding upon admission were most typical, and the attack was the first one, so far as could be ascertained.

During the first five days following the removal of the appendix and drainage of the abscess cavity the convalescence was uneventful. Suddenly, on the evening of the sixth day, without any prodromal symptoms, the patient had a slight chill and his temperature rose to nearly 104° F. On the following day he appeared apathetic, but he had no chill, although his fever rose to 102° F. On the eighth day after operation—*i. e.*, forty-eight hours after his first slight chill—he had a severe chill and his temperature again rose to 104° F. The accompanying chart (Fig. 384) shows the course of the fever and the frequent recurrence of the chills during the interval since the severe chill at the end of the first week following the operation up to the present time, three weeks later—*i. e.*, four weeks after the operation.

The chills and fever have been accompanied by marked evidences of a generalized infection within the vascular system. The skin and visible mucous membranes have become more and more icteric, the pulse is very rapid and compressible and the sensorium more dull every day, so that he appears extremely ill today.

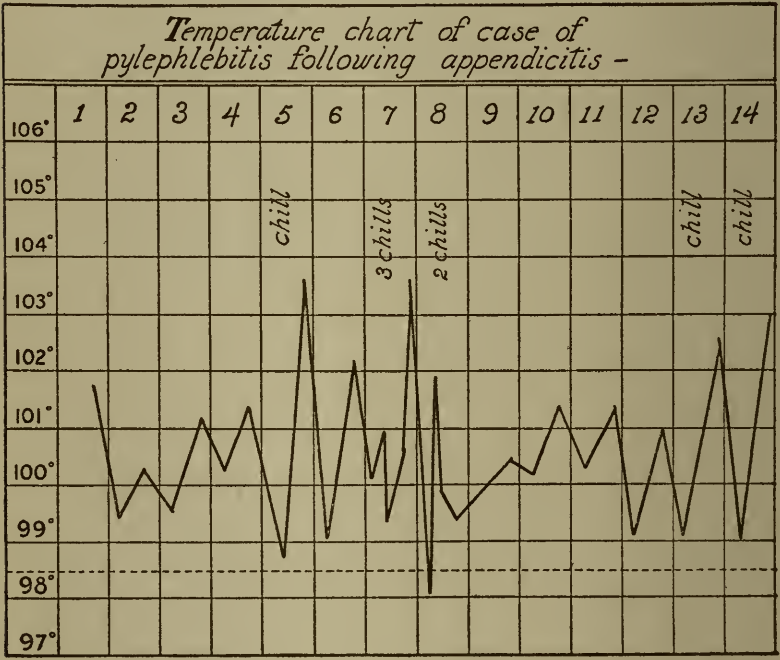

Fig. 384.—Temperature chart from case described in lecture. Note slight postoperative rise for first five days, then recurrent chills and high fever until death four weeks after operation.

Since the appearance of the first symptoms of a generalized infection every effort has been made to determine the cause of the chills and fever, and especially to ascertain whether a definite focus could be found, and, by establishing drainage, assist the patient to combat the infection which has already spread so widely within his vascular system.

The complications of acute appendicitis may be classified as follows:

1. Acute gastric dilatation.
2. Generalized peritonitis.
3. Formation of abscesses adjacent to the appendix.
4. Intestinal obstruction:
    (*a*) Immediately after operation (duplex ileus).
    (*b*) Paralytic or adynamic ileus.
    (*c*) Late ileus from bands, kinks, etc.
5. Subphrenic abscess with or without an accompanying serous or purulent pleuritic effusion.
6. Empyema (right or left sided) without an accompanying subphrenic abscess.
7. Pylephlebitis (infection extending from the veins of the appendix into the intrahepatic radicles of the portal vein).
8. Hemiplegia due to embolism of one of the cerebral vessels.
9. Phlegmonous infiltration of the abdominal wall in the vicinity of the incision.
10. Thrombophlebitis of the veins of the lower extremities.
11. Acidosis.
12. Pyelonephritis.

Let us consider these complications in detail, and attempt to make a diagnosis of the complication in this case by exclusion.

1. *Acute Gastric Dilatation.*—Either as a complication of a generalized peritonitis or independently of such an extensive infection of the peritoneal cavity, paresis of the musculature of the stomach may occur, and unless recognized early and treated by repeated gastric lavage, may cause death by interference with the action of the heart and lungs through upward pressure upon the diaphragm (Fig. 385). Such a complication is not infrequent after the majority of abdominal operations, but is most likely to take place within the first thirty-six to seventy-two hours after an operation for acute appendicitis or gall-bladder disease.

The clinical pictures presented by this much-dreaded complication are:

(*a*) Symptoms of interference with the cardiac and respiratory organs in the form of cyanosis, marked dyspnea, cold sweat, and rapid, weak pulse. The only local findings in this class of cases (in which vomiting such as characterizes the other clinical variety plays a minor part) is a marked distention of the upper abdomen and a tympanitic note over the heart. In this form the diagnosis of acute gastric dilatation is very difficult to make unless such a possibility is constantly borne in mind whenever the convalescence from an abdominal operation is not as uneventful as one expects. If there is the least doubt in your mind about the existence of such

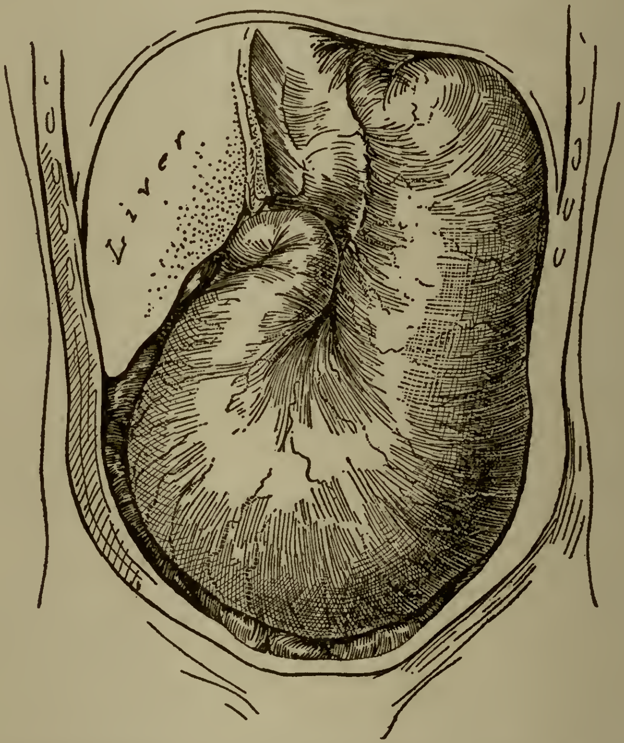

Fig. 385.—Autopsy view of an acutely dilated stomach complicating an operation for acute appendicitis.

a condition after an operation, the passage of a stomach-tube and the evacuation of large quantities of brownish, sour fluid, followed by immediate cessation of all of the above symptoms, will clear up the diagnosis.

(*b*) The more frequent clinical picture of postoperative acute gastric dilatation is where vomiting without effort of large quantities of brownish, sour liquid is accompanied by all of the above symptoms (cyanosis, dyspnea, cold sweat, rapid pulse, and extreme prostration). The passage of a stomach-tube and thorough gastric lavage, the patient being placed on his side so as to avoid aspiration into the lungs, will be followed by immediate relief of symptoms, which if allowed to continue would result unquestionably in a fatal outcome. I cannot emphasize too strongly the necessity of keeping such a complication constantly in mind after an operation for acute appendicitis such as our patient has had. The absence of any of the symptoms I have just mentioned enables us at once to exclude this complication.

2. *Generalized Peritonitis.*—The abdomen of this patient, although distended, is soft and not tender to palpation. The absence of vomiting, the fact that there are no signs of intestinal obstruction, and the relatively slow pulse in the intervals between the chills would at once exclude a generalized peritoneal infection.

3. *Localized Intra-abdominal Abscess.*—The absence of any localized rigidity or tenderness and the fact that the fever is intermittent and not of the continuous type, as one would expect if there were an abscess close to the appendix, and exploration of the wound for such a focus with negative results excludes this complication. The most frequent form of localized suppuration which can give rise to fever after operation is an abscess located in the true pelvis. In such cases muscular rigidity and tenderness may be of minimal degree, and only rectal or vaginal palpation enable one to make a diagnosis. At times, for a number of weeks after drainage of a generalized peritonitis, abscesses may become walled off in any portion of the abdominal cavity and give rise to persistent fever, but chills are never present.

4. *Intestinal Obstruction.*—(*a*) The paralytic or adynamic ileus which may follow an operation for acute appendicitis does not differ in any respect from that which may complicate all abdominal operations. The enormous abdominal distention, inability to obtain the passage of flatus, and the vomiting are due to paresis of the intestinal musculature, and respond readily in many cases to small doses of pituitrin. (*b*) By ileus duplex (Fig. 386) I refer to a form of intestinal obstruction in which the coils of the last—*i. e.*, terminal—portion of the ileum have become agglutinated in the true pelvis, and kinking of the afferent upon the efferent loops of ileum results with obstruction of the fecal current. In many cases, especially in children, where the appendix lies in the true pelvis, one is often surprised to find symptoms of intestinal obstruction on the third or fourth day after

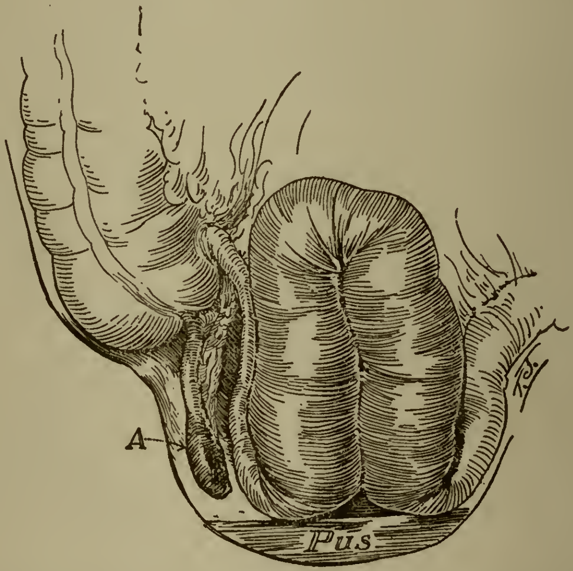

Fig. 386.—A form of intestinal obstruction which may complicate acute appendicitis when appendix (*A*) lies in true pelvis and coils of terminal ileum become agglutinated and lie in pus. In these cases the abdominal distention, vomiting, and inability to pass feces or flatus is not relieved by the removal of the appendix and drainage of the abscess (see text).

removal of the appendix and drainage of a pelvic abscess unless the occurrence of this form of ileus is borne in mind.

(*c*) Late ileus may be due to the persistence of the kinks just referred to, but is more often caused by bands of inflammatory origin tightly constricting some coil close to the original seat of trouble. The symptoms are those characteristic of ileus in general. In our patient, although there is abdominal distention,

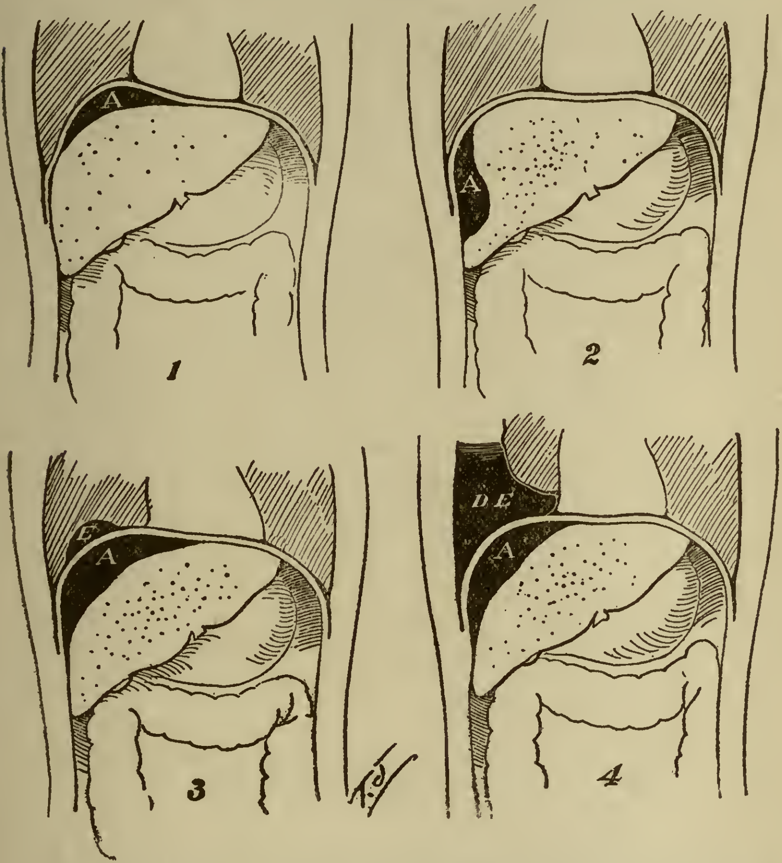

Fig. 387.—Most frequent varieties of right-sided subphrenic abscesses: 1, Abscess (*A*) beneath dome of diaphragm. 2, Abscess (*A*) between side of diaphragm and right lobe of liver. 3, Large subphrenic abscess (*A*) complicated by an encapsulated (*E*) empyema lying between right lobe of lung and diaphragm. 4, Large subphrenic abscess (*A*) complicated by a diffuse empyema (*D*, *E*).

there are none of the other symptoms of intestinal obstruction, such as vomiting and the inability to secure the passage of flatus or feces. We can thus exclude ileus of any form as the cause of the postoperative complication in this patient.

5. *Subphrenic Abscess.*—By this we mean a more or less extensive collection of pus in the space between the right lobe of the liver and the diaphragm on the right side, or between the left lobe of the liver, stomach, spleen, and diaphragm on the left side. The right-sided subphrenic abscesses are, as a rule, due to extension of infection from the appendix, from the gall-bladder, or as the result of the perforation of a duodenal ulcer. Left-sided subphrenic abscesses usually follow perforation of a gastric ulcer, especially of the lesser curvature or the posterior wall. A left-sided abscess after appendicitis is quite rare, although I have reported such a case.

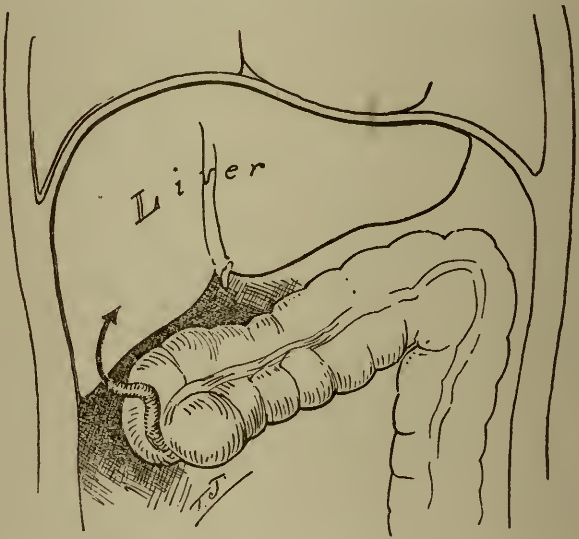

Fig. 388.—Arrow indicates route taken by infection toward subphrenic space in a case of non-rotation of the cecum.

The abscess may occupy only a relatively small space under the dome of the diaphragm, or between the side of the right lobe of the liver and the diaphragm (Fig. 387). It is surprising to find how small an amount of pus in a subphrenic abscess can give rise to a most grave clinical picture following an operation for appendicitis. The abscess is usually intraperitoneal, but may occasionally lie entirely extraperitoneal. It may follow the removal of the appendix even when there has been no visible pus formation. It is very rarely seen as a localization of pus in a generalized peritonitis.

The extension of infection from an appendix attached to a cecum which has not rotated (Fig 388) and lies just below the liver, is readily understood. How such an infection extends from an appendix attached to a fully rotated cecum and spreads to the subphrenic space is best explained by assuming that the infection travels along the inner or outer "gutter" (Fig. 389) of the ascending colon. The frequent occurrence of subphrenic abscess in cases of retrocecal appendicitis is readily explained in this manner. The lymphatics undoubtedly play an important part in this extension of infection to the subphrenic space.

At times, as we shall presently see, the intrahepatic branches of the portal vein or the lymphatics draining the appendix region are the seat of an extensive infection which may spread to the liver tissue and result in the formation of a solitary or of multiple abscesses, which by continuity extend into the subphrenic space. Involvement of the pleural cavity with the formation of a serous or purulent exudate is a not infrequent complication of subphrenic abscesses.

Rupture into the lung, although rare, reveals itself clinically by the expectoration of large quantities of pus, usually with a very fetid odor.

As a rule, pus alone is found, but the additional presence of gas occurs often enough to explain some of the peculiar *x*-ray findings to be referred to later.

The most important data upon which to base a diagnosis of subphrenic abscess after an operation for appendicitis such as this patient has had are (*a*) the history, (*b*) the physical examination, (*c*) the *x*-ray examination, and (*b*) the results of exploratory puncture.

The history of apparent recovery followed by the persistence of or the sudden appearance of fever after an operation for appendicitis should always cause one to search for a subphrenic abscess. Chills are never present unless the focus is secondary to an intrahepatic infection, as I have just explained.

Physical examination reveals little unless the abscess lies close to the costophrenic sinus or has displaced the liver downward.

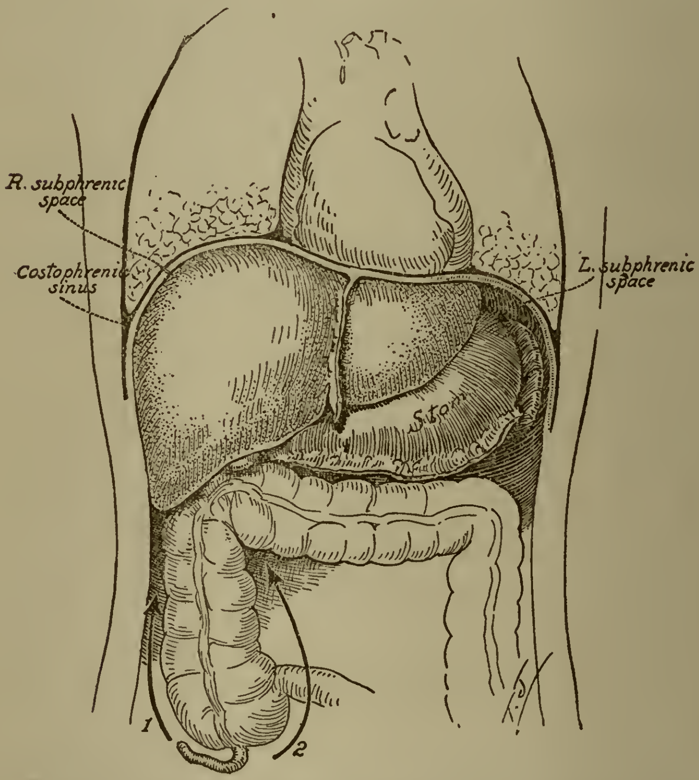

Fig. 389.—Topographic relations of the organs of upper abdomen to those of thorax. Arrows indicate how infection travels along outer or inner edge of ascending colon from appendix to subphrenic space.

Normally, as you will recall from your course in physical diagnosis, the upper border of the liver dulness during expiration is at the sixth rib in the mammary line, at the eighth rib in the midaxillary line, and at the tenth rib in the scapular line (Fig. 390). During inspiration the lung descends into the costophrenic sinus,

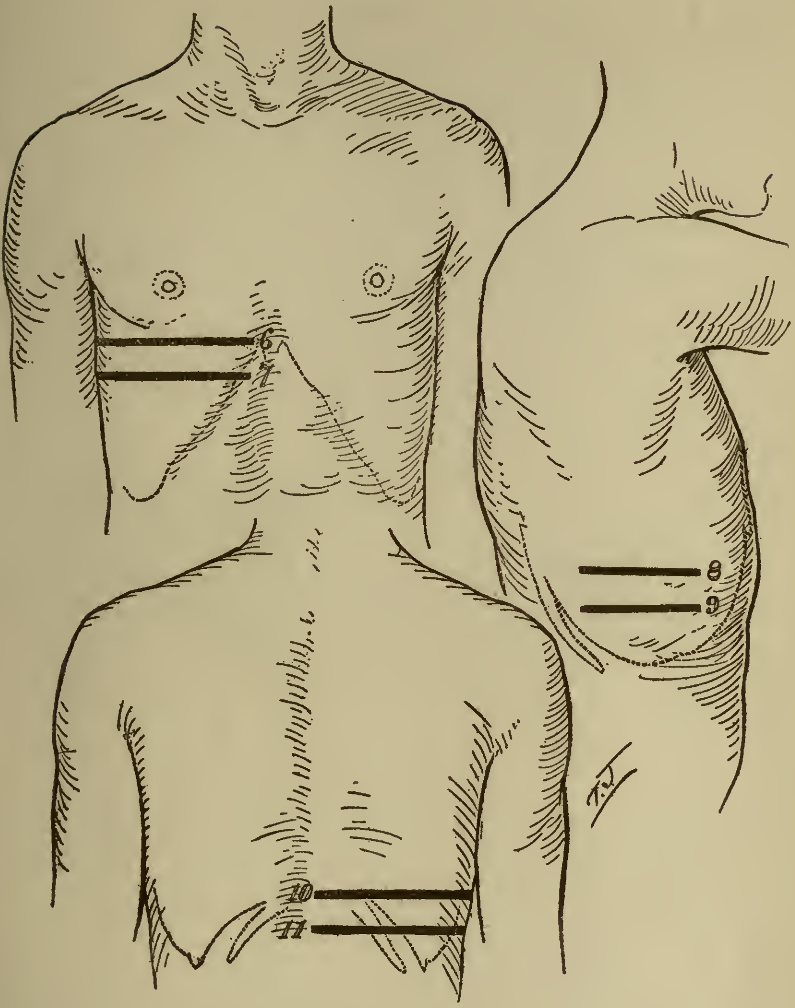

Fig. 390.—Anterior, posterior, and lateral views of thorax showing normal range of respiratory mobility of lower border of lung in the costophrenic sinus. The absence of a change in percussion-note at these levels (see text) upon deep inspiration is a very valuable sign in subphrenic abscess.

so that the upper border of liver dulness lies at the seventh, ninth, and eleventh ribs respectively. A convenient way to remember these important data are by the figures 6-8-10 and 7-9-11.

Now I have seen a comparatively large number of cases of subphrenic abscess, and whenever the respiratory excursion of the lung fills this space completely and there is no area of dulness, with a convex upper border (Fig. 391), I feel that the physical examination at least is of no aid in the diagnosis.

A coexistent pleuritic effusion will, of course, cause the upper border of the dulness to extend much farther up than in a subphrenic abscess alone, and cause this upper border to be horizontal (Fig. 391, 2) instead of convex (Fig. 391, 1).

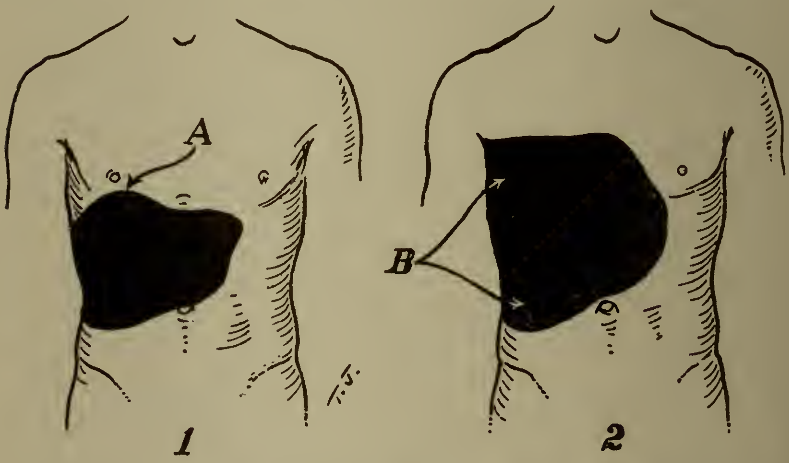

Fig. 391.—1, Normal liver dulness with abnormal area of dulness due to subphrenic abscess (*A*). Note convex upper border of latter. 2, Area of dulness when a subphrenic abscess is complicated by a diffuse empyema. Note how the normal liver dulness is indistinguishable from that due to the subphrenic abscess and empyema (*B*).

Roentgenoscopic examination with the patient in an upright position, if possible, and the use of stereoscopic *x*-ray plates have become the two most accurate methods of diagnosis of this complication of appendicitis. We can at once determine whether the right or left half of the diaphragm possesses its normal contour and range of mobility. When a diffuse or encapsulated pleural effusion is present on the right side, the liver shadow merges directly into that due to the fluid in the pleural cavity (Fig. 391). If such an effusion is absent, the diaphragm shows a more or less circumscribed elevated shadow[1] due to the collection of pus in the subphrenic space, so that an exact localization of the extent and position of the subphrenic abscess is possible by roentgenoscopy alone, and confirmed by the taking of stereoscopic plates.

Exploratory puncture should only be undertaken when one is prepared to operate immediately after the employment of this method. The entire subphrenic space itself must be explored in a systematic manner from the median line in front to the spine behind. One may at first find clear fluid and then pus if the needle has passed through a serous effusion in the pleural cavity first and then through the diaphragm into the subphrenic abscess. I recall one of my cases of subphrenic abscess in which the needle was inserted eight times before pus was found. Since the introduction of roentgenoscopy, exploratory puncture is seldom employed in our larger hospitals.

We have employed roentgenoscopy three times since the chills and fever have appeared in this patient, with negative results. Examination of the respiratory mobility and upper and lower borders of liver dulness also show no changes from the normal relations. Finally, we have made a systematic examination with an exploratory (Record) syringe of the right subphrenic space and only found a few shreds of a fibrinous character, which evidently had their origin within the liver, but have found no pus. These examinations repeated at frequent intervals during the past three weeks justify the conclusion that a subphrenic abscess and an empyema can be excluded.

6. *Empyema.*—This is a rather infrequent complication of appendicitis, but it may be present independently of a subphrenic abscess. Like the latter, it is not characterized by symptoms such as pain or tenderness or prominence, which might be of service in calling attention to the presence of a complication. Whenever fever persists or recurs after an operation for acute appendicitis, the first complications you must think of are (*a*) abscesses which escaped detection at operation or have formed since that time, (*b*) subphrenic abscesses, and (*c*) empyema. The

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[1] If gas is present in addition to pus, a clear area represents the space occupied by the gas.

absence of the well-known physical signs of empyema and the negative x-ray examination enable me to exclude empyema as the cause of the serious clinical picture which the patient presents today.

Hemiplegia, Phlegmon of the Abdominal Wall, Acidosis, Femoral Phlebitis, and Pyelonephritis.—Hemiplegia, as the result of the transport of an embolus from the appendix region to the brain, is a rather rare complication, but I have observed such a case. Infection of the abdominal wall may prove to be a very serious factor in the prognosis of a case of suppurative appendicitis in which insufficient drainage[1] has been established. The pyogenic organisms multiply very rapidly in the loose areolar tissue between the muscles forming the abdominal wall as well as in the subcutaneous fat. I have observed a fatal outcome in 2 cases following an operation for acute appendicitis with generalized peritonitis. Examination of this patient's wound fails to show any retention of pus, so that this complication may also be eliminated from further consideration. The same is true of acidosis because this complication presents itself under one of a number of different clinical pictures. In the majority of my own cases of postoperative acidosis a persistent hiccup, accompanied by vomiting and the presence of acetone and diacetic acid in the urine, has comprised the most frequent syndrome. In children I have observed a number of cases in which delirium, restlessness, high temperature, and rapid pulse have been the chief symptoms of the acidosis.

Pyelonephritis, usually of hematogenous origin, is characterized clinically by the frequent recurrence at irregular intervals of chills and fever. As a rule, only one kidney is involved and the organ is enlarged and tender. The urinary findings are insignificant in comparison with the severity of the clinical picture. The presence of frequently recurring chills and fever in our patient is suggestive of such a complication, but the absence of any localizing symptoms referable to either kidney rather speaks against a pyelonephritis as the cause of the septic condition in this case.

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[1] The peritoneum is much more resistant to infection than the tissues of the abdominal wall, and I have observed some extremely severe gangrenous phlegmonous invasions of the abdominal wall, especially after a generalized peritonitis.

Thrombophlebitis of the femoral or popliteal vein may occur on the right or on the left side, and is characterized by pain, swelling, and a whitish, tense edema of the skin.

Pylephlebitis.—By this is understood an infection of the terminal branches of the portal vein within the liver. The infection usually travels by way of the veins of the mesentery of the appendix into the veins which pass upward between the folds of the ascending mesocolon to form the right colic vein, and from here the thrombophlebitis extends into the superior mesenteric vein and then to the portal vein itself (Fig. 392). The predominance of irregularly recurring chills and fever in the clinical picture and the absence of any localizing signs stand out as the most striking clinical features of this much-dreaded complication of acute appendicitis. Let us stop for a moment and consider the salient points up to the present time in this case, and see if our diagnosis of pylephlebitis is justified.

Male, aged thirty-nine, enters hospital February 26, 1917, with pain in right lower quadrant of abdomen, nausea, and vomiting. Had been sick for three days. Upon admission, tenderness and a mass the size of a lemon in right lower quadrant.

White blood-count, 12,200. Appendectomy on day of admission for gangrenous retrocecal appendix, with perforation and abscess near tip. On March 3d drain removed; profuse wound discharge. Two days later first slight chill and fever, and again, four days later, a very severe chill and high fever. Since March 12th frequent chills, followed by fever at irregular intervals, accompanied by gradually increasing evidences of systemic infection (icterus, etc.). Repeated examinations (physical diagnosis, *x*-ray, and exploratory puncture), all negative. Same true of wound and even of rectal examination.

Now when we consider that we have excluded all of the other complications, there remains but one which will best explain the clinical picture presented by this patient.

All of his symptoms are those of a very severe form of infection within the vascular system. The recurrence of the chills

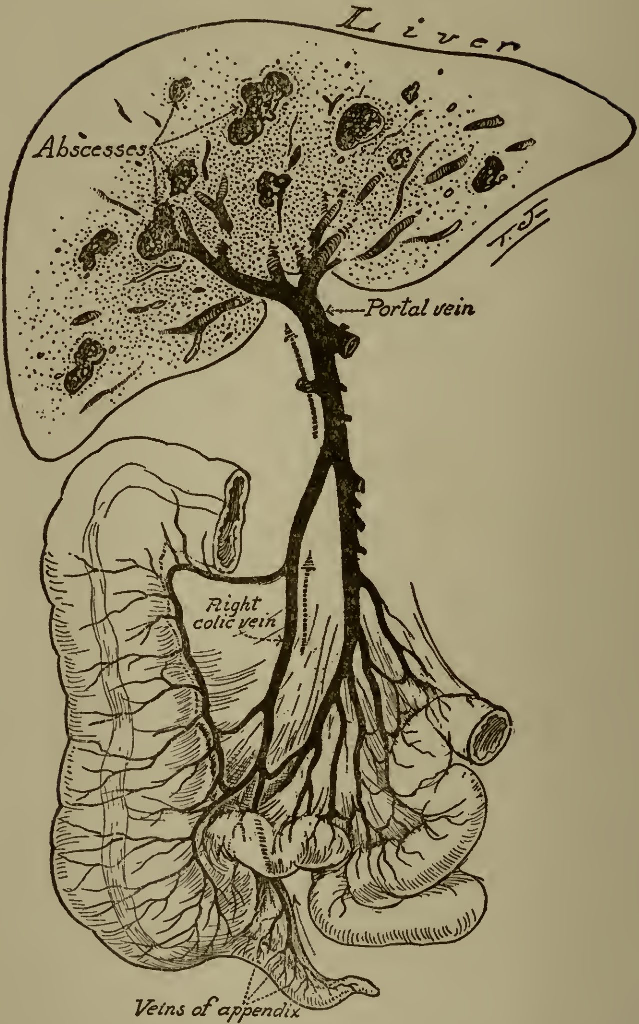

Fig. 392.—Suppurative pylephlebitis due to extension of infection from appendix as in case referred to in text. Note how the veins of the appendix empty by way of the right colic and superior mesenteric veins into the portal vein, and from this to its innumerable radicles, causing multiple intrahepatic foci and later generalized intravascular infection.

and fever at irregular intervals, marked prostration, dry tongue and skin, icterus, rapid pulse, and lethargy are all the result of a severe sepsis, and are best explained by the assumption that the infection has spread rapidly during the past four weeks from the blood-vessels of the appendix region by way of the intrahepatic veins into the systemic circulation. In other words, a localized appendiceal thrombophlebitis has by extension caused a similar condition within the liver (pylephlebitis) and, indirectly, a generalized bacteriemia. Whenever repeated chills and fever follow an operation for acute appendicitis one of the first conditions you must think of is the complication which will unquestionably result fatally here.[1]

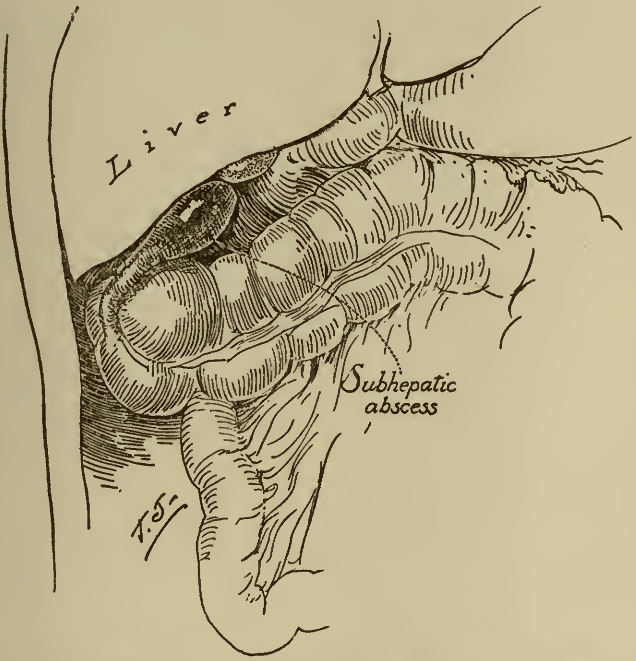

Fig. 393.—Subhepatic abscess complicating gangrenous appendicitis in an appendix attached to a non-rotated cecum. This occurred in one of my cases in a boy of fifteen, causing symptoms of an acute infection in the right upper quadrant.

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[1] The septic condition of the patient became progressively worse, and he died about five weeks after the original operation. Consent to hold an autopsy was not obtained.

TWO CASES ILLUSTRATING THE CLINICAL IMPORTANCE OF CONGENITAL ANOMALIES OF THE KIDNEY

Summary: Case 1.—Hydronephrosis of the lower half of a double kidney having two ureters and two pelves; nephrectomy; ideal points in the diagnosis of double kidney; treatment.

Case 2.—Pyelonephritis of double kidney, predominating in the lower half; nephrectomy.

I DESIRE to show you today a patient from whom the left kidney has been removed for an infected hydronephrosis of the lower half of a double kidney. The patient is a woman, forty-seven years of age, whose chief complaint upon admission four weeks ago was a severe pain in the left upper quadrant of the abdomen. The pain had been present in a severe form for a week before coming to the hospital. Prior to this increase in the severity of the pain she stated that she had noticed a pain of a less severe character for some months from which she had been unable to obtain relief. The pain was always accompanied by vomiting, which latter symptom had been especially prominent during the period of more acute exacerbation. There was increased frequency of urination.

The previous and family history were negative. Examination upon admission showed marked rigidity and tenderness in the left upper quadrant of the abdomen, which extended to the left into the iliocostal space. Owing to the high temperature and extremely septic condition of the patient when first seen by me cystoscopy and ureteral catheterization were deemed inadvisable. A röntgenogram of the urinary tract failed to show any abnormal shadows. The shadow of the right kidney could be distinctly seen, but that of the left was indefinite. The urine contained a moderately large amount of pus.

A diagnosis of left-sided pyonephrosis was made and drainage as a temporary measure of relief seemed indicated. Four weeks ago an incision was made, extending from the angle of junction of the last left rib with the erector spinæ obliquely downward to a point about 1 inch above the anterior superior spine of the ilium. After division of the abdominal muscles the perirenal fat was exposed and found to be very edematous, as is so often the case in the vicinity of an infected kidney. Upon separating the perirenal fat a large, tensely filled sac was exposed, which at the time of this first operation was thought to be the entire kidney converted into a sac containing pus. This was incised and a quart of thick pus evacuated. Examination of the interior of this sac showed that we had opened an infected hydronephrosis, only a narrow zone of kidney parenchyma remaining intact. On account of the septic condition of the patient removal of the kidney at this time was deemed inadvisable.

The patient improved greatly after this drainage and the temperature returned to normal for about three weeks. For the past week, owing to the difficulty of maintaining the drainage, her fever has recurred and she has become quite septic again, necessitating a second operation.

During the interval between her first and second operations I catheterized the ureters and found a single ureteral opening on each side. The urine escaped immediately after introduction of the catheter from the right ureter, and the examination of this urine and of the functional capacity of the right kidney revealed a normal functionating organ. From the left ureter we obtained a very turbid urine containing many pus corpuscles, but the functional test showed considerable activity on this side which we were at a loss to interpret, because, at the first operation, very little kidney tissue had been found.

At the second operation, yesterday, we removed a large sac, which at first was thought to be the entire kidney converted into a hydronephrotic sac. After separation of this sac from its bed of firm adhesions the existence of an upper normal half, almost completely separared from the pathologic lower half, became apparent. Owing to the presence of so many old adhesions it was impossible to separate the two halves, and a complete nephrectomy was done.

The specimen is that of a kidney having two uterers and pelves. The upper half is of normal appearance and consistency. It is about two-thirds the size of the adult kidney (Fig. 394, 1), and has a ureter which enters on its mesial aspect close to the constriction which represents the line of separation between this upper normal half and the lower hydronephrotic sac. The ureter of this upper half passes in a tortuous manner along the posterior surface of the lower hydronephrotic half. The two ureters joined at about the level of the true bony pelvis, thus accounting for the occurrence of a single ureteral opening, as found at the time of the cystoscopic examination. The ureter of the lower half entered the sac close to the line of constriction between the two halves (Fig. 394, 2). The kidney when opened shows a perfectly normal upper half (Fig. 394, 2), with the exception that there is an absence of parenchyma at the lower pole. The lower half of the double kidney is represented by a hydronephrotic sac with only a narrow rim of parenchyma. At the point of origin of the ureter, near the upper end of the sac, is a valve-like fold of mucous membrane which was an important factor in obstructing the escape of urine from the lower half (Fig. 394, 3).

The anomalous faulty origin of the ureter, from the upper pole of the lower renal pelvis and the valve at the outlet of the pelvis, were the direct cause of the hydronephrosis. Infection of the stagnant urine occurred and the clinical picture detailed to you resulted. The case is of importance in many respects. It shows that anomalies of the kidney are no longer a subject of interest to the pathologist alone, but the fact that they are especially liable to certain pathologic changes (hydronephrosis or the formation of calculi) makes them assume great importance from a clinical standpoint. The ideal points in the diagnosis of these cases of double kidney are: (*a*) the discovery of more than a single ureteral orifice on one or both sides of the bladder, (*b*) the passage of shadowgraph catheters into both ureters, and (*c*) a pyelogram showing two separate ureters[1] and renal pelves (Fig. 395). Although the occurrence of double kidney is men-

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[1] The finding of two separate meati on one side does not necessarily indicate the existence of separate pelves, since the two ureters may unite above the bladder.

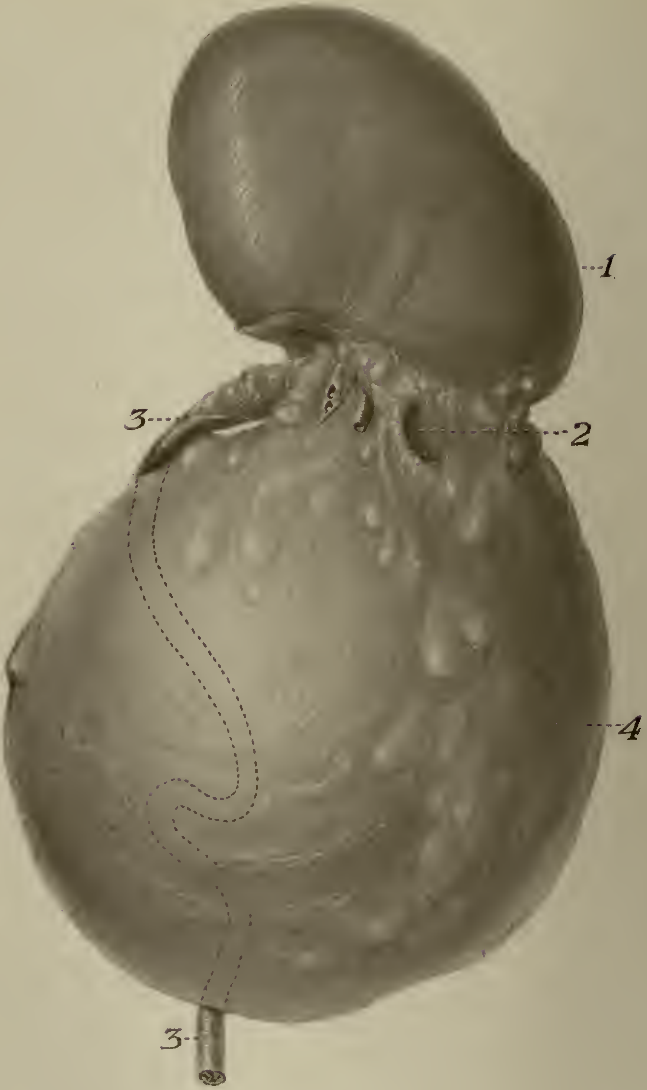

Fig. 394.—Posterior aspect of double kidney having two pelves and two ureters. Hydronephrosis of lower half of kidney due to faulty origin of the ureter (2) with valve formation. 1, Upper half of kidney. 2, Opening of ureter of lower half. 3, Ureter of upper half passing across back of hydronephrotic lower half.

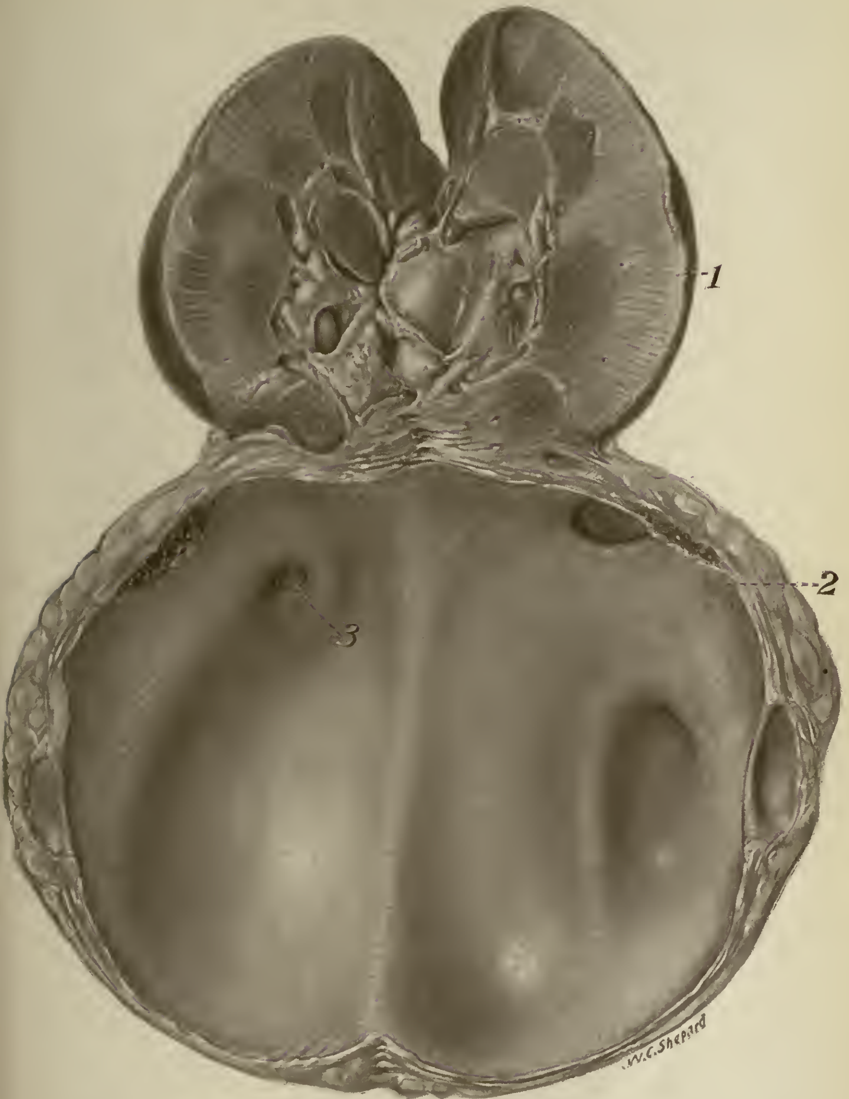

Fig. 395.—View of relations of lower hydronephrotic half of the author's case of double kidney to the upper normal half. 1, Upper perfectly normal half with its pelvis (for course of ureter, see Fig. 394). 2, Interior of hydronephrotic lower half. 3, Valve obstructing opening of ureter (with anomalous origin) of the lower half.

tioned in a number of treatises on surgery of the kidney, there are relatively few references to the clinical importance of these anomalies. Israel[1] describes a case quite analogous to my own of an infected hydronephrosis in the upper half of a double kidney, also due to an anomalous origin of the ureter. In 5 cases reported by Braasch[2] the various pathologic conditions affecting the half of a double kidney and necessitating operation were 2 cases of hydronephrosis resulting from anomalous blood-vessels constricting the ureter near its entrance into the renal pelvis, 2 cases of hydronephrosis resulting from stricture at the wall of the bladder, and 1 case of hydronephrosis and stone.

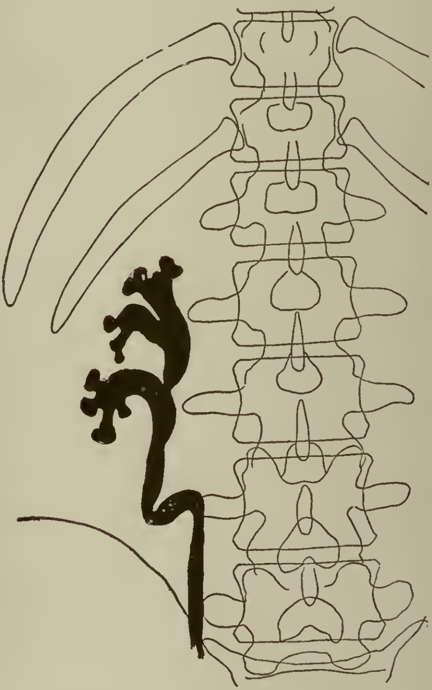

Fig. 396.—Pyelogram of a kidney having two separate pelves and a joint ureter (Braasch).

I have been able to find a case similar to my own in an old

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[1] Nierenchirurgie (Monograph published in 1903).
[2] Annals of Surgery, November, 1912, p. 727.

German inaugural thesis, showing the origin of the ureter from the ventral side of the upper end of the lower half of the kidney

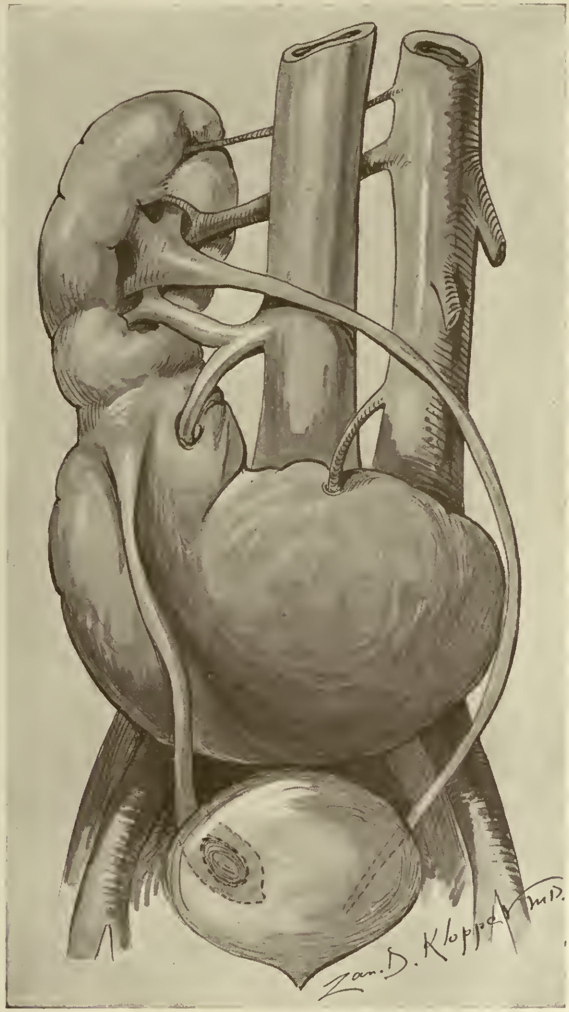

Fig. 397.—Hydronephrosis of lower half of a solitary completely fused kidney. The ureter of the lower half of the solitary kidney was obstructed by a calculus resulting in hydronephrosis (from a German inaugural thesis).

with resultant hydronephrosis (Fig. 397). The ideal method of treatment of these cases of double kidney would be resection of the diseased half, and W. J. Mayo[1] was able to do so in 3 cases. In many cases of double kidney, however, there is such a fusion of the parenchyma of the two halves that separation is impossible, as shown in the second case of double kidney which I

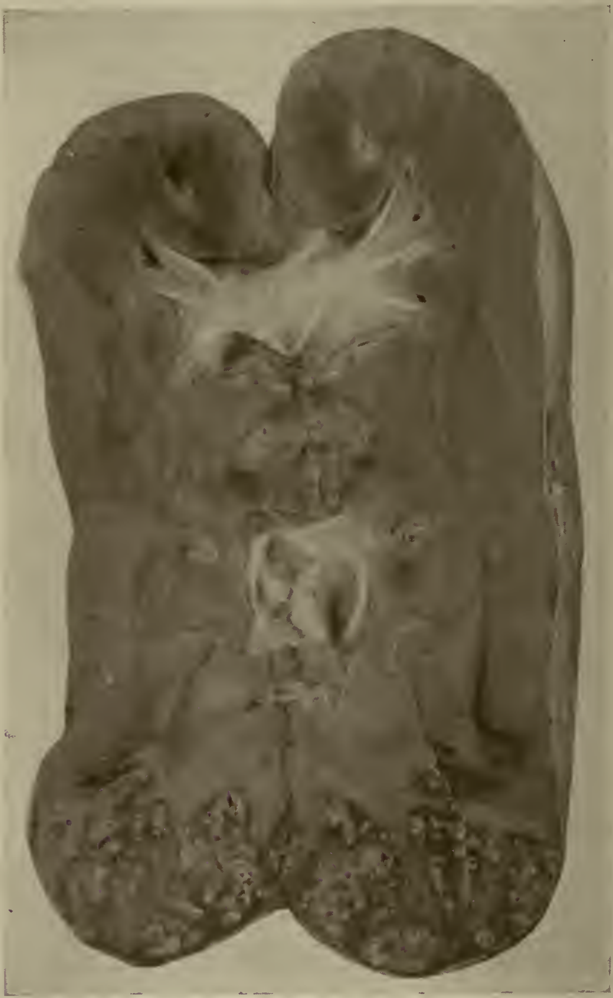

Fig. 398.—Pyelonephritis in lower pole of a kidney having two separate pelves and two ureters, but no separation of the parenchyma.

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[1] Quoted by Braasch (*vide supra*).

shall show you and which required removal on account of recurrent attacks of sepsis.

Case 2.—This patient is a woman, twenty-five years of age, who was first admitted six weeks ago on account of severe pain over the left kidney, radiating downward along the course of the ureter. Her temperature, localized tenderness and rigidity, urinary and cystoscopic findings all indicated an infection of the left kidney. There was a single ureteral orifice on each side of the bladder, and röntgenograms showed a renal shadow on each side of normal size and location. After three weeks of non-operative treatment she left the hospital, but with the recurrence of the same symptoms she re-entered. Operation was decided upon, the left kidney exposed, and considerable inflammatory edema of the tissues around the lower pole found. The kidney showed a number of miliary abscesses scattered over the surface, but at the lower pole these were present in very large numbers.

During the separation of the kidney from its bed the presence of two ureters was noted, but owing to the absence of any line of separation between the two halves the entire kidney was removed. When opened the cut surface (Fig. 398) shows the lower pole studded with a large number of miliary abscesses probably of ascending lymphogenous[1] origin. There are two renal pelves and two ureters, but the parenchyma of the two halves are completely fused, showing that resection of the pathologic half would have been impossible. This case is another example of the clinical importance of anomalies of the kidney.

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[1] See recent publications of the author on the subject of Ascending Infections of the Kidneys, Jour. Med. Research, 1917, xxxv, p. 295; Journal Amer. Med. Assoc., 1917, lxviii, p. 540.

CLINIC OF DR. HUGH McKENNA

ST. JOSEPH'S HOSPITAL

A CASE OF PERFORATED DUODENAL ULCER

Summary: Hematogenous origin of many gastro-intestinal lesions—gastric and duodenal ulcers and appendicitis; outstanding points in the diagnosis of duodenal ulcer; recognition and management of ruptured ulcer; intractable hemorrhage, failure of adequate medical management, marked cicatricial narrowing and perforation the chief indications for surgical interference.

I WISH this morning to present briefly a review of the subject of duodenal ulcer with the report of a case recently operated on for rupture of an ulcer.

Since the publication by Mr. Traveis of a report of his first case of duodenal ulcer in the London Medico-Chirurgical Transactions of 1817, vol. viii, p. 232 (Moynihan), much discussion has arisen over the pathology, diagnosis, and treatment of stomach diseases. The splendid investigations of E. C. Rosenow has done much to lay a scientific foundation for our conceptions of the etiology of gastric and duodenal ulcer. Because of the frequency of these diseases in medical practice, this discussion is devoted particularly to them.

Etiology.—Any one who has followed the experiments of Rosenow, and especially one who has had a fair observation in the surgery of the stomach, must come to the conclusion that ulcers have a definite relation to focal infections, such as those occurring about the mouth, ears, sinuses, etc. That they are hematogenous infections, occurring in the same manner that inflammation is set up in the appendix, I think there is no question. A very striking example of the relation of focal infection to appendicitis occurred in one of our surgical residents at the hospital during the past year, Dr. M., whose history I shall give briefly. This case is cited because I believe that it explains the relationship between the infected tonsil and the appendix, and that infections of the tonsil bear the same relationship to ulcers of the duodenum.

One week previous to his attack of appendicitis the patient was taken down with an acute streptococcic tonsillitis. The bacteriologic examinations were made by Dr. G. F. Dick, under whose care the patient was at this time. Convalescence progressed satisfactorily for one week, at which time the patient developed typical symptoms of acute appendicitis, for which condition I operated upon the patient under novocain anesthesia, owing to the presence of the throat infection. The operation was at 8 o'clock in the evening. The assistant pathologist made smears and cultures directly from the mucosa of the appendix in the operating-room. Examination of these cultures at 8 o'clock the following morning showed a most interesting condition. A very extensive growth covering all but a thin line in the center of the blood-agar slant which, upon microscopic examination, showed the colon organisms. The growth over the thin line in the center of the tube, so narrow that just a fine platinum needle could be inserted between the rapidly enveloping growth of the colon colonies, was examined, and found to be the same hemolytic type of streptococcus that had been isolated from the tonsils one week previously. The patient made an uneventful recovery.

I have removed gastric ulcers and perigastric glands in which, upon section in paraffin, bacteria were demonstrated by staining reaction.

Diagnosis.—The subject of diagnosis has been so thoroughly worked out that there is little to say respecting gastric and duodenal ulcer. Suffice it to mention that I depend more upon the history and the roentgen-screen findings than anything else. The history, when carefully taken in duodenal ulcer, is so typical with respect to periodicity, the attacks occurring usually in the autumn and spring, pre-meal pain, pain particularly at midnight, and vomiting at the same midnight hour if at all, coupled with rapid gastric peristalsis, as demonstrated with the

x-ray screen, that not much doubt need be felt concerning the diagnosis. The finding of blood in the stomach contents or in the feces will depend upon the time of examination and the age of the ulcer. The importance of diagnosis is shown in the fairly large percentage of complications arising from unrecognized and untreated cases of ulcer.

Surgical Treatment.—There still remains a great difference of opinion between internists and surgeons respecting the proper method of treating ulcer, especially duodenal ulcer.

There seems to be no question but that all cases of ulcer of the pylorus and duodenum with constriction should be handled surgically, and that a no-loop posterior gastro-enterostomy should be made with or without excision of the ulcer, depending upon its location. In all cases in which the ulcer is not removed the scar should be covered by means of a purse-string suture or flap of omentum.

It is needless to say that immediate surgical treatment is imperative in the cases of rupture of the ulcer. Within the past few months I saw in consultation with two other physicians a case with the following history:

The patient, a lawyer, thirty-three years of age, was taken suddenly ill while seated in his chair in his office, the pain in the abdomen being so severe that he fell practically unconscious to the floor. Two physicians in the adjoining building were called. They made a diagnosis of gangrenous appendicitis with rupture. An ambulance was called and the patient was sent to the hospital, but owing to the delay of the ambulance he did not arrive there until about two hours after the onset of the pain.

Upon examination of the patient I found an individual in a semicomatose condition, very anemic looking, and suffering excruciating pain, especially upon pressure, in the upper abdomen. There was some rigidity of the right side of the abdomen, but no blood in the vomitus, nor had there been any history of blood in the vomitus. The history of so-called dyspepsia and a similar attack one year previously was given. Blood examination showed a leukocytosis of 14,000. Upon the history, which was quickly taken, I made a diagnosis of ruptured ulcer of the duodenum.

The patient was a bad risk because of a bad heart condition, and it was necessary to operate upon him rapidly. An incision was made at the right rectus border high enough to expose the stomach and at the same time low enough to permit examination of the appendix. Upon opening the abdomen the appendix was readily exposed and found to be very large and acutely inflamed. Both the attending men were then assured that his condition was one of acute appendicitis, but it was apparent that the pathology in the appendix was not sufficient to account for the symptoms that were present. Upon placing a laparotomy pad in position, and lifting up the abdominal wall, the anterior portion of the first segment of the duodenum came plainly into view, showing the scar of an old ulcer, with a small rupture the size of a 22-caliber rifle bullet in it, and the contents of the stomach pouring out into the free peritoneal cavity. Owing to the very bad condition of the patient it was decided not to attempt a posterior gastro-enterostomy, the usual method of treatment for these cases, but to be content with simple closure of the ulcer and drainage.

The outcome of this case was so favorable, both with respect to the immediate and after-treatment, and to the subsequent history of the patient that I think it worth while to present the operative details, even though they are not new, by means of the accompanying plates. Figure 399 shows the position of the ulcer with the Lembert mattress sutures in place, closing the ulcer in such a manner as to increase the lumen of the duodenum, which I feel is very important in these cases. Figure 400 shows the method of using the pedicled flap of omentum to cover these sutures and to guard against recurrence of the perforation. A drain was placed in the abdomen, which remained for a matter of four or five days and was removed. The patient started taking nourishment by mouth on the fifth day and made an uneventful recovery.

Upon these two points there is no difference of opinion: First, that ulcers with cicatricial narrowing of the lumen of pylorus or duodenum sufficient to produce definite obstruction with symptoms should be treated by operation, and, second,

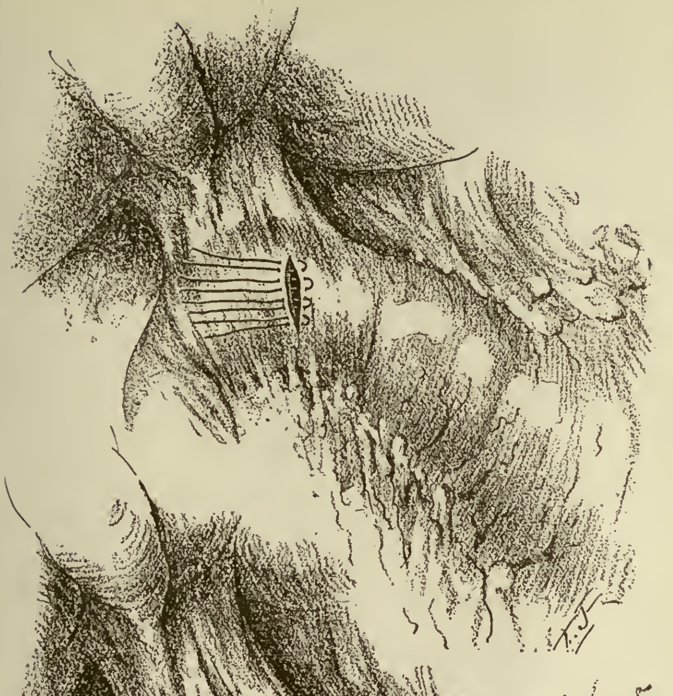

Fig. 399 (upper) and Fig. 400 (lower).—Illustrating method of closing perforation and protecting closure by omental flap.

that perforated ulcers demand surgical intervention. With regard to the management of the other types of ulcer the dispute is still raging. I would be inclined to advise that, in addition to the above, all ulcers which show a tendency to repeated hemorrhages in spite of careful medical management, and those which resist a reasonable trial of accurate, well-controlled, medical treatment, should be accorded surgical therapy. All simple ulcers may be clinically cured without operation, and it is advisable to refer such cases to competent internists.

THE EARLY RECOGNITION AND TREATMENT OF ACUTE APPENDICITIS

Summary: Necessity for a renewal of the campaign of education in the early diagnosis of acute appendicitis; pain, nausea and vomiting, fever, and leukocytosis the cardinal symptoms of appendicitis; cases without nausea and vomiting—reasons for their occurrence; differential diagnosis—ruptured tubal pregnancy; acute gall-bladder disease; acute pancreatitis; renal and ureteral calculus.

Before operating this morning I wish to discuss briefly the acute surgical lesions of the abdomen with special reference to the recognition and treatment of appendicitis. I have called your attention to the subject of appendicitis from the fact that I believe this subject must be brought more forcefully before the profession than it has been during the last ten or fifteen years. In large hospitals one sees many neglected cases of acute appendicitis in spite of the fact that we of late have fancied that every medical man was able to recognize this lesion at its very inception. This, however, is not the rule, and it has been my experience that many doctors are not able to give the symptoms of appendicitis in the order that is characteristic of their appearance, and that enables one to make a differential diagnosis at a time when that diagnosis means proper surgical treatment.

During the past few weeks I have had occasion to operate upon the following cases, a brief history of which I will give, which enables you to see the stage at which many of them are brought to the surgeon.

Case I.—Dr. B., a dentist, thirty-eight years of age, weighing in the neighborhood of 275 pounds, short and stocky, with a history of a heart lesion due to a streptococcic infection of his throat, blood-pressure of 200, and a chronic nephritis. He was taken ill with typical symptoms Sunday morning at 5 o'clock. A doctor was called, and the patient was seen regularly by the doctor once or twice a day until Thursday afternoon, at which time he was seen by me in consultation. At this time he gave a history of having been seized with severe cramps in the abdomen which seemed to center in the pit of the stomach. During the forenoon of the same day he was nauseated and vomited. The pain and vomiting continued, and on the evening of the same day his temperature rose to 101.5° F. On Monday the tenderness became more localized and the temperature continued, but not so high, ranging around 99.5° F. These symptoms continued until Thursday afternoon, when I saw him. At that time his abdomen was greatly distended and there was marked rigidity of the right rectus abdominis muscle. He had a leukocyte count of 18,000.

Because of his bad physical condition he was operated upon under local anesthesia, using novocain as the anesthetic. The appendix was the size of a small banana, adherent to the brim of the pelvis, gangrenous, and so matted to surrounding structures that it was taken out only with the greatest difficulty. The abdomen showed signs of peritonitis and contained considerable seropurulent fluid. The abdomen was drained and the patient made an uneventful recovery, but remained in the hospital for six weeks.

Case II.—Mr. H., taken sick on Thursday morning at 5.30 o'clock with symptoms identical with those of the patient just described. He was under the care of a physician until Sunday afternoon, when I saw him in consultation, and recommended his being taken to the hospital for immediate operation.

I present here the appendix which was taken out on the fourth day after the onset of the symptoms (showing large gangrenous appendix). This speaks for itself. The interesting feature to be noted in this case is that, with a history absolutely typical, this patient was taken back and forth between his home and a local hospital on Saturday in a taxicab, and given bismuth meals for *x*-ray pictures, a series of which were taken on Saturday and again on Sunday morning, with this acute gangrenous mass in the abdomen which might have ruptured at any time. After operation the abdomen was drained and the patient made a good recovery, though he was very ill for three or four days following the operation.

Case III.—Mr. C., whose symptoms were practically identical with those of the two former patients, was operated on in the last part of the second day and had not been seen by a doctor until a few hours before I was called in consultation. I also show you his appendix, showing a gangrenous spot the size of a dime, which burst just after it was taken out of the abdomen. This patient made an uneventful recovery, and was discharged from the hospital within two weeks from the time of the operation, this short stay being due to the fact that it was not necessary to drain the abdomen.

Case IV.—On the day following the operation upon Mr. C. I was called in consultation to see Mrs. N., who gave the following interesting history: Dr. F. O. Frederickson, an associate of mine, was called to see this patient at 1 o'clock in the afternoon. She complained of considerable generalized pain in the abdomen, but no nausea, vomiting, nor rise in temperature. Dr. Frederickson instructed her to call him in the event of any nausea or vomiting occurring during the night. This occurred at 8 o'clock in the evening, though the doctor was not called to see her until 9 o'clock the following morning. He immediately made a diagnosis of acute appendicitis, and ordered her sent to the hospital in an ambulance. However, his advice was not followed and the patient was brought to the hospital in a taxicab.

Upon examination, it was very apparent that the patient was suffering with acute appendicitis. With the history of the pain having lessened during the trip to the hospital, and the fact that she was able to straighten the right leg which had been drawn up during the night, I was able to make a diagnosis of a ruptured appendix, though it was only sixteen hours since the onset of the condition.

The patient was immediately taken to the operating-floor, and during the preparation, just before the anesthetic was started, the nurse reported that the patient had a very marked chill. This meant to us that contents of the appendix had broken into the peritoneal cavity at least one hour previous to this time, which was during the trip to the hospital in a taxicab.

Upon opening the abdomen free pus escaped from the peritoneal cavity. The appendix presented and was taken out. The abdomen was drained and the patient made an uneventful recovery, remaining in the hospital about five weeks.

I have described these 4 cases not because of the fact that they are uncommon or that there is anything unusual about them, but rather to point out, as Dr. Murphy said to me a few weeks before his death, "it will be necessary to go over again the diagnosis and treatment of acute appendicitis. Much as we believed, fifteen years ago, that the medical men of this country had gotten hold of the subject, it is apparent that there are far too many who do not appreciate its importance, and I intend, therefore, when I get back into harness in September to write an extensive article upon the subject of the diagnosis and treatment of acute appendicitis." Let me ask here: What are the symptoms, in the order of their appearance, upon which we may make an early diagnosis of acute appendicitis? First, pain, cramplike in character, generalized, usually referred to the pit of the stomach, the patient usually stating that it is not an appendicitis because of the fact that the pain is not on the right side. Second, nausea or vomiting. In this connection let me ask: How many men actually determine whether the nausea or vomiting came before or after the pain? It must always follow the pain. Third, rise in temperature, which usually occurs in the first twenty-four hours. This, however, may be misleading, depending entirely upon the variety of the appendicitis. Fourth, increased leukocyte count. This again may be misleading, and should not be relied upon if it does not coincide with the clinical symptoms encountered. I have been in the habit for years of having a differential count made in all cases, and this is especially true where the leukocyte count is low. If there is a relatively high polymorphonuclear leukocytosis, it is of significance. Later, particularly in the beginning of the second twenty-four hours, the location of the pain in the lower right quadrant becomes manifest.

As exceptions to the general rule we find a few cases in which nausea or vomiting has not been present. On the basis of a study of several cases of this type that I have had occasion to operate on, I wish to offer an explanation of their occurrence. During the past year one of the junior residents in the surgical service at this hospital was taken ill. History of this case given in this clinic under name of Dr. M. A week before the date of my seeing him he had a streptococcic infection of the tonsils, which was carefully examined bacteriologically in the laboratory of the hospital. (Bacteriology of this case will be reported in a later clinic.) On this day, which was a week following, he was taken with acute pain in the abdomen and with all the clinical manifestations of acute appendicitis, and consequently was ordered to the operating-room. On account of the throat condition I operated under local anesthesia. The operation took place within three hours from the onset of his pain, and up to this time he had had no nausea nor vomiting. Upon reaching the appendix and making traction upon it, the patient immediately remarked, "There is the pain I have had in my stomach," referring to his stomach, and immediately began vomiting. Each time traction was made upon the appendix the pain was referred to the stomach and vomiting followed. It occurred to me, consequently, that traction upon the appendix and the mesentery of the appendix with its nerve supply might be responsible for the nausea and vomiting of the early stages of appendicitis. With this in mind, I have examined carefully the situation about the appendix in those cases upon which I have operated for appendicitis where there has been no history of nausea or vomiting. I have been able to show in at least 3 cases that the appendix and mesenteriolum were fixed so that practically no traction could be made upon them, and I offer this as a possible explanation of the absence of nausea and vomiting in such cases. A history of constipation ordinarily accompanies appendicitis.

The important conditions to be differentiated from acute appendicitis are: ruptured tubal pregnancy, acute gall-bladder disease, acute pancreatitis, renal or ureteral stone, and disease of the right ureter.

Ruptured Tubal Pregnancy.—History of missing menstrual period; sudden, severe pain in lower abomen, sharp and cutting in character; early distention of the abdomen, which is confined at first to the lower abdomen; the skin is anemic and has a deathly pallor; the extremities are cold; the surface of the body is bathed with a clammy perspiration; the face has an anxious, pinched expression and there is twitching of the facial muscles. Nausea and vomiting are common symptoms and delirium and convulsions may occur. The patient may complain of impaired vision and of ringing in the ears. There is a rapid pulse, subnormal temperature, and increased leukocyte count.

Acute Gall-bladder Disease.—History of typhoid or chronic appendicitis or intestinal infection; acute colicky pain in upper right quadrant of the abdomen, radiating around under the right costal arch to the back and sometimes to the right shoulder; vomiting; a history of belching of gas. Jaundice may or may not be present.

Acute Pancreatitis.—Sudden onset of agonizing epigastric pain accompanied by persistent vomiting; severe collapse; weak and rapid pulse; belching and hiccups; distention of the upper abdomen due to disturbance of innervation in the transverse mesocolon; acute anemia due to hemorrhage (occasionally); grayish, pinched appearance; dyspnea has been noticed in many cases (Musser). Sugar may be found in the urine.

Stone or Disease of the Right Ureter or Kidney.—Sharp pains shooting into the bladder and penis and down right leg; during severe colic great beads of perspiration come out over the body; blood or pus may be found in the urine. Ureteral catheterization, combined with use of the *x*-ray, may clear up the diagnosis. With the patient sitting on the edge of the bed, leaning forward without support, the Murphy hammer-stroke will elicit sharp pain if the disease is in the kidney or upper portion of the ureter.

This brief outline of the differential diagnosis of conditions simulating acute appendicitis shows how readily these conditions may be run down in the ordinary hospitals with modern laboratory methods.

I believe we cannot lay too much stress upon the value of the time element in the early hours of these diseases. I do not recall a single fatality in my own experience for the operative relief of acute appendicitis where I saw the case during the first twelve hours following the onset of the attack. I believe this is the experience of every operator of very wide experience. When we come to compare with this the mortality percentage of the cases that are operated on after the first twenty-four hours is there not just reason for surgeons, called upon to operate on such neglected cases, to register a firm protest against the influences which are responsible for the delay?

For many years I have used the operation made at the outer border of the right rectus muscle. In the suppurative cases with rupture we attempt to remove the appendix in the large majority of cases if the appendix presents. However, this is done with the utmost care respecting the surrounding viscera. We practically never do more than drain a case of this type if it appears that we shall not be able to go down upon the appendix and remove it without disseminating the infection about the field of operation. I am of the opinion that the recovery is much more rapid and complications much less frequent where the ruptured appendix is removed.

CLINIC OF DR. HARRY E. MOCK

ST. LUKE'S HOSPITAL

A CASE OF BICHLORID OF MERCURY POISONING DIAGNOSED AS, AND OPERATED ON FOR, PERFORATED GASTRIC ULCER

ALTHOUGH I cannot demonstrate this patient to you, I wish to recite the circumstances of his illness because of the unusual coincidence of symptoms which caused a diagnosis of perforated gastric ulcer to be made, when the existing condition was finally proved to be that of bichlorid of mercury poisoning.

Dr. W., fifty-eight years old, who had been a practising physician until ten years ago, was admitted to the Surgical Service of St. Luke's Hospital on December 9, 1916, at 8 P. M.

On admission the patient was suffering from acute abdominal pain, hematemesis, and hiccoughs. He was in a semicomatose condition. The history of his sickness was obtained from his wife, who was a graduate nurse. She stated that ten days ago the patient began to vomit and complain of epigastric pain. The next day he vomited considerable blood, and this vomiting of blood had occurred at two- or three-day intervals until this day, when he vomited blood several times. The abdominal pain became very intense on December 9th. Blood had been present in the stools since the first attack of hematemesis.

Five days previous to his taking sick, or on December 4th and 5th, there was complete suppression of urine for forty-eight hours. The flow of urine had been fairly good until the day of admission, when it again became scanty. A urinalysis made on December 6th showed albumin, hyaline casts, and blood, according to the wife's statement.

The patient had lost considerable weight during the last ten days, but previous to that he had gained weight. For the past forty-eight hours there had been a low, muttering delirium, but no complete coma.

Past History.—Patient had a gastric ulcer thirty years ago, but was cured. He had gall-bladder trouble four years ago, at which time he was operated on. He had suffered for years from mucous colitis, hemorrhoids, and fistula *in ano.* Three years ago he had a partial stroke of paralysis, but recovered. At that time his blood-pressure was 200 mm. He was a morphin user for years up to the time of the passing of the Antinarcotic Act, but since then had not used the drug.

Examination on admission showed a small, emaciated man of fifty-eight years. Temperature 97° F.; pulse 108, and of poor quality; blood-pressure, systolic 138 mm., diastolic 78 mm. Head and neck negative except pin-point pupils—perhaps due to four doses of morphin in the last twenty-four hours. They reacted sluggishly to light. Pyorrhea was very marked. Lungs were negative; heart dulness out to nipple line, but no murmurs. There was tenderness over the whole abdomen, but no marked rigidity. Tenderness and marked rigidity on light pressure over the epigastrium. The genitalia were negative. The extremities showed a low-grade edema of the ankles. The tendon reflexes were very sluggish.

Laboratory Findings.—A catheterized specimen of urine showed a large amount of albumin, no sugar and numerous hyaline and granular casts, and many red blood-cells. The blood examination showed: Erythrocytes per cubic millimeter, 3,640,000; leukocytes per cubic millimeter, 34,000; hemoglobin, 60 (Salli). Differential count: Large lymphocytes, 3 per cent.; neutrophils, 97 per cent. Analysis of the vomitus: Amount, 65 c.c., reddish-brown color, free blood, no food particles, free HCl none, combined acidity 15. The microscopic examination was negative except for blood-cells.

The patient was admitted to the surgical service of Dr. A. E. Halstead, who saw him immediately. Dr. Halstead felt that the case should be treated medically until sufficient time had elapsed for a complete study, and the patient was, therefore, transferred to the medical service of Dr. Charles Elliott.

The epigastric pain and rigidity increased considerably and the vomiting of blood became more profuse. A second blood examination taken two hours after admission gave a leukocyte count of 42,000, and an hour later the leukocyte count had reached 54,000.

A diagnosis of perforated gastric ulcer was made, and I was called at 11.30 to operate on the patient. My examination confirmed the diagnosis, and the patient was operated on immediately.

An ether anesthetic was administered, 4 ounces being used altogether. The abdomen was entered through a right rectus incision. The gall-bladder was found greatly dilated, but contained no stones. The stomach and duodenum were carefully examined, but no sign of an ulcer could be found. Exploration of the intestines failed to reveal any pathology. The appendix was slightly enlarged, but not inflamed. The pancreas seemed slightly enlarged and harder than normal. The omentum and the mesenteric lymph-glands and the liver were perfectly normal. The right kidney was enlarged. The appendix was removed and the gall-bladder opened and drained. This was done, first, because of the dilated condition of the gall-bladder, and, second, so that the patient could be fed through the gall-bladder, as advocated by Dr. McArthur. The abdomen was closed in layers.

The patient died fourteen hours after the operation. The autopsy revealed a consolidated area in the right lower lobe of the lung; enlarged kidneys, with marked hemorrhagic, inflammatory changes. The stomach and the duodenum were entirely negative, but the esophagus showed numerous areas of petechial hemorrhages. The ascending and transverse colon showed many small ulcers. The autopsy diagnosis made by Dr. Adelbert Moody was lobar pneumonia, acute hemorrhagic nephritis, and ulcerative colitis.

The autopsy findings did not account for the acute abdominal symptoms and the excessive hematemesis, which had been the prominent features in this case.

Fortunately, the esophagus, stomach, and colon had been saved from the autopsy. At the suggestion of Dr. E. R. LeCount, consulting pathologist to the hospital, these organs were turned over to the Coroner's Office for chemical examination.

This chemical examination revealed bichlorid of mercury present in sufficient quantity to cause death. Further investigation by the Coroner's Office failed to reveal how or when the patient took the bichlorid of mercury. His wife gave the additional information that Dr. W. had attempted suicide six months previously by gas-poisoning. The case was signed out as suicide by bichlorid of mercury poisoning.

CLINIC OF DR. DAVID C. STRAUS

Michael Reese Hospital

HAMMER-TOE

Summary: A case of hammer-toe of the right great toe purposely produced in order to avoid military service; etiology, pathologic anatomy, and clinical types of hammer-toe; treatment—the Thilo insole and the Ernst splint; operative measures—the Jones operation; amputation unjustified as a rule; procedure and results in the present case.

This case is of interest not only because it is unusual to see hammer-toe of the great toe only, but because of its unique etiology, the conservative operative treatment, and the satisfactory cosmetic result.

The patient, a Russian, thirty-eight years of age, entered the Michael Reese Hospital to be relieved of a hammer-toe of his right great toe because it caused him considerable discomfort in walking. Whenever he was on his feet much he would have pain at the tip of the toe and also over the head of the first phalanx. He did not wish to have the toe amputated, but insisted that he must have relief and was willing to submit to amputation if that were necessary.

Examination of his feet showed that the right great toe was the only toe affected. The other toes were normal and well shaped. This made the deformity of the right great toe all the more striking. The first phalanx of this toe was hyperextended, while the second phalanx was strongly flexed at the interphalangeal articulation, so that the patient bore his weight on the tip of the toe in walking (Fig. 401). There was a hard corn over the most prominent point of the dorsal surface of the head of the first phalanx where this prominent knuckle sustained the pressure from the shoe, and a hard callus at the tip of the toe;

The interphalangeal joint was ankylosed. As the only similar hammer-toe I had seen was in another Russian, I surprised the patient when I asked him if he had not had the deformity produced artificially while in Russia. He smiled and admitted that he had, eleven years ago, to escape military service. He said that a great many men in his part of the country had had this deformity produced to avoid having to serve in the army, and that there were medical men who made a regular practice of performing the operation. The operation consisted in making a transverse incision across the plantar surface of the toe through the interphalangeal articulation, hyperflexing the joint, and immobilizing the toe in this position by means of a splint which was left in place for about a month or until healing occurred. In his own case three days after the operation to produce the deformity the joint became infected, and there was a discharge of pus from a small opening over the dorsal surface of the joint. This persisted as a sinus for three weeks. Then healing occurred.

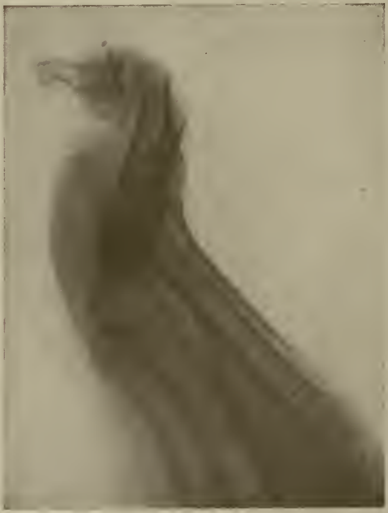

Fig. 401.—Artificially produced hammer-toe of the right great toe only. Roentgenogram—lateral view. The distal phalanx stands at right angles to the proximal phalanx. The head of the distal phalanx is flattened from pressure in walking. The head of the proximal phalanx is greatly deformed.

Later the hard corn developed at the site of this perforation and has persisted ever since. This he regularly trimmed down, as it otherwise caused him great pain. He now demands that he be cured of his deformity.

Hammer-toe is a deformity of the toes which consists of dorsiflexion of the first phalanx and plantar hyperflexion of the second phalanx. In toes with three phalanges the position of the third phalanx varies—it may have the same direction as the second or it may be bent dorsally or plantarward.

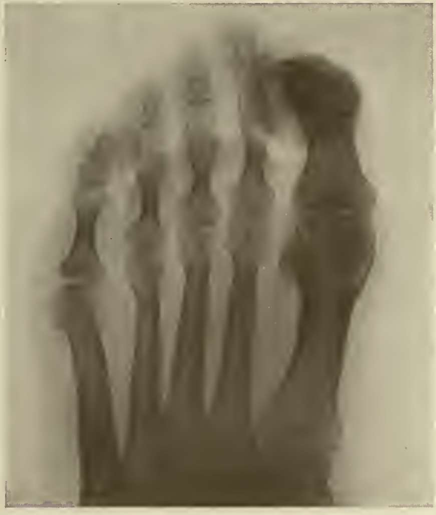

Fig. 402.—Artificially produced hammer-toe. Roentgenogram—dorsoventral view.

The deformity is congenital in some cases. Heredity plays a more important part in this deformity than in any other deformity of the foot, and Anderson has traced it to heredity in at least a fourth of his cases.[1] As a rule, however, it is acquired, and usually results from the wearing of shoes that are too short, and is often associated with, and hence may be secondary to, hallux valgus. Rarely it may be due to a contraction of the plantar fascia, and it is then associated with pes cavus and talipes equinus.

[1] The Lancet, vol. ii, 1891, p. 213.

The deformity most often affects the second toe, with or without the others, but it is uncommon for the great toe to be thus deformed. The condition is frequently bilateral.

Occasionally the great toe alone may be affected. As a rule, then, the interphalangeal joint is flexed. However, it may be hyperextended, and in such cases the flexion contracture is in the metatarsophalangeal articulation.

Nicoladoni described a rare deformity of the foot which he called "hammer-toe flat-foot" (pes malleus valgus). The great toe is flexed at right angles at the metatarsophalangeal articulation and there is a rigid flat-foot. Later Ranneft, Kirsch, Hofmann, and Vulpius described hammer-toe formation with adduction position of the great toe (hallux malleus varus), associated with rigid flat-foot. While, according to these authors, the second and third toes are likewise held in the adducted position, the deformity is most marked in the great toe. The anterior portion of the foot is supinated and the arch of the foot is sunken (club-toe flat-foot). Some authors assume that in these cases the flat-foot is a result of the contracture of the toes. On the contrary, Borchardt[1] agrees with Hofmann in believing that hammer-toe is a position of relief in the case of painful conditions of the leg and foot (flat-foot, affections of the knee, scars on the foot, etc.) which at first is only temporary, but later becomes permanent. Rubritius also believes this position of the toes is an anatomic compensation deformity of flat-foot. Treatment, therefore, under such circumstances must be directed toward the correction of the flat-foot. The correction of the deformity of the toes is of only secondary importance.

Slight grades of hammer-toe cause the patient no discomfort. When a patient comes to the surgeon because of a hammer-toe it is usually one of high grade, and in such cases there is usually a painful corn or callus over the head of the first phalanx and a painful corn or callus at the tip of the toe. In addition, there is usually a painful callus on the plantar surface of the foot over the head of the metatarsal bone. There is frequently also a subcutaneous adventitious bursa over the head of the first

[1] Handbuch der Praktischen Chirurgie, 1914, vol. v, p. 1231.

phalanx beneath the ever-present callus. This bursa is usually painful, may become fistulous, and may communicate with the joint. The condition, therefore, may become so painful that the patient is unable to wear a shoe.

Shattuck and Adams point out that, whatever the original cause may be, the chief obstacles to reduction are the shortened lateral ligaments and the contracted capsular ligament. Although the flexor and extensor tendons are contracted, division of them alone is not sufficient to remove the deformity. The lateral ligaments must be divided.

If inflammation extends from the bursa to the joint there may be ankylosis between the first and second phalanges.

In regard to *treatment, in slight cases, where the second toe alone* is affected, attention to the shoes and the various measures for correcting the hallux valgus are of value, especially if, in addition, the deformed toe is straightened manually several times every night and morning. *When all the toes are slightly affected* sandals are generally recommended, the individual toes being bound down by separate elastic loops. For these cases, too, the insole suggested by Thilo is worthy of mention. This is made of firm sole-leather. Holding the foot on this leather insole one draws the outlines of the affected toes. Midway between the two margins of each affected toe—that is, in a line corresponding to the long axis of the toe—two holes are drilled through the entire thickness of the insole, one near the proximal and one near the distal extremity of the toe, so that these holes lie approximately 1½ cm. apart. A string or thin tape is placed along the axis of the plantar surface of the affected toe and the two are bound together with adhesive plaster. The ends of the tape are drawn through the holes beneath the toe and knotted on the under surface of the insole. The stocking is put on over this and the shoe worn.

In case *a single toe is affected* this same device may be used or the **T**-spring devised by Ernst. This is a metal splint, suitably padded, made in the form of a letter **T**. The horizontal bar of the **T** fits across the sole of the foot, and is held in place by a band that passes over the dorsum of the foot. The vertical part of the **T** is made correspondingly smaller and lighter, and extends along the plantar surface of the deformed toe, which is extended and bound down upon it. Lange[1] has suggested an insole, similar to the Thilo insole, except that it extends over the anterior part of the foot only, and Jones uses a short splint somewhat similar to the Ernst idea. The stocking is put on over all these.

In cases that are *slightly more advanced* it may be necessary to forcibly correct the deformity under an anesthetic before applying one of the splints just mentioned. A distinct snap or crack is felt when the lateral ligaments give way.

In cases in which *the deformity is marked*, and *in the adult when a rapid and lasting cure is desired, one must resort to operation.*

W. Adams and also Tubby[2] have had good results from *subcutaneous division of the ligaments.* A tenotomy knife is introduced through the skin crease on the plantar surface of the toe, beneath the first interphalangeal articulation. The knife is passed upward, beneath the skin, avoiding the digital vessels and nerves, and the edge is then turned toward the bone and the lateral ligaments divided. Continuing the division on the plantar surface of the joint, the flexor tendons and capsular ligament are divided, and then, without withdrawing the knife, the remaining lateral ligament is similarly divided, cutting toward the bone, as before. The toe can usually now be easily straightened, and any remaining fibers are forcibly ruptured if necessary. In some cases it is necessary, in addition, to divide the contracted extensor tendon. The toe is then put up on a splint until healing has occurred, after which a **T**-splint is worn until the deformity shows no tendency to recur.

The same result has been obtained by an open operation on the plantar surface of the toe, dividing all the soft structures, skin, tendons, and joint-capsule until the toe can be extended This is known as Peterson's operation, and has been strongly recommended by Hoffa. The toe is then immobilized in the corrected position for three to four weeks. This gives good results in some cases, but where the deformity has been great recurrence frequently follows. For this reason the operation has been largely abandoned.

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[1] Centralbl. f. orth. Chir., 1911.

[2] Deformities, Including Diseases of the Bones and Joints, 1912, vol. i, p. 365.

Resection of the first interphalangeal articulation is to be recommended instead. This is probably the *operation of choice* in most cases. It may be performed through a plantar incision to one side of the flexor tendon, as recommended by Albee, or through a dorsal incision. Binnie prefers a lateral incision, although he admits that this makes the operation more difficult.

Arthroplasty has been suggested, but is not to be advised.

Some surgeons, in order to obtain a new joint, leave the articular cartilage on one side of the joint. Jones in a recent article[1] states that no attempt to produce a pseudo-arthrosis at the proximal interphalangeal articulation should ever be undertaken; that this operation should be condemned as uncertain, for his experience has been that it is very frequently followed by recurrence.

In the case I am presenting I removed the head of the first phalanx, and left the base of the second phalanx intact, but I did not do this with the idea of obtaining a movable joint. In this case the joint was ankylosed as the result of the old suppurative arthritis. As the head of the first phalanx was greatly deformed (see Fig. 401) a great deal of the first phalanx had to be removed, whereas the base of the second phalanx was fairly normal, and was, therefore, saved to give sufficient length to the toe. No attempt was made to obtain a movable articulation, nor was one anticipated.

Jones[2] finds the following operation most uniformly satisfactory; "A wedge-shaped excision (Fig. 403), removing the articular cartilage on both sides of the joint, so as definitely to ankylose the joint in extension. An oval piece of skin, including the corn, is excised over the prominent knuckle. A wedge, base upward, including the joint, is then excised, of sufficient size to allow the toe to be straightened. The flexor tendon is divided by tenotomy. The skin incision is then stitched so as to leave a transverse linear scar. The toe is fixed down to the toe-splint and the patient walks about, still wearing the splint inside his boots, for some weeks, to make sure that solid ankylosis occurs without any return of the deformity."

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[1] The British Medical Journal, June 3, 1916, p. 782.

[2] Ibid.

In some cases *exarticulation* or *amputation* of the deformed toe is the most logical procedure. *Amputation should be avoided wherever possible,* and one important point must constantly be borne in mind in this connection. If the second toe is removed, the tendency to the production of a hallux valgus is greatly increased, and "often leads to a second disability more serious than the original hammer-toe." The indiscriminate amputation of toes for hammer-toe is certainly to be condemned. Jones even goes so far as to say that amputation should never be done.

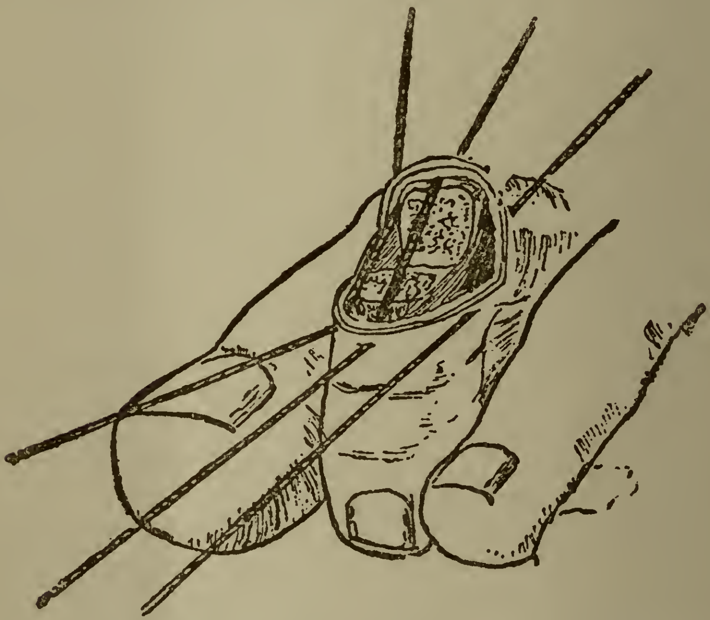

Fig. 403.—Jones' operation for hammer-toe; wedge excision of the interphalangeal articulation to produce ankylosis in corrected position.

To return to the case under discussion, the operation was performed as follows: After the usual preparation, and under gas-ether anesthesia, an incision was made parallel to and just to the lateral side of the tendon of the extensor pollicis longus, on the dorsal surface of the right great toe, the incision extending from the middle of the first phalanx to the middle of the second phalanx. The incision was placed to the lateral side of the tendon so that the scar would not be subject to shoe-pressure. The above-mentioned tendon was next exposed and dissected free from the joint capsule to which it was adherent as the result of the original operative infection. In separating the tendon from the joint capsule it was necessary to divide the tendon. Next, the soft parts were separated from all about the head of the first phalanx, using a periosteal elevator to accomplish this, and then the elevator was left *in situ*, to hold the soft parts away from the bone. Now the joint was opened or, rather, the joint surfaces were dissected apart, for, due to the old suppuration in the joint at the time of the original operation, there existed a partial bony ankylosis of the joint. The head of the first phalanx was now extended strongly upward, so that it protruded above

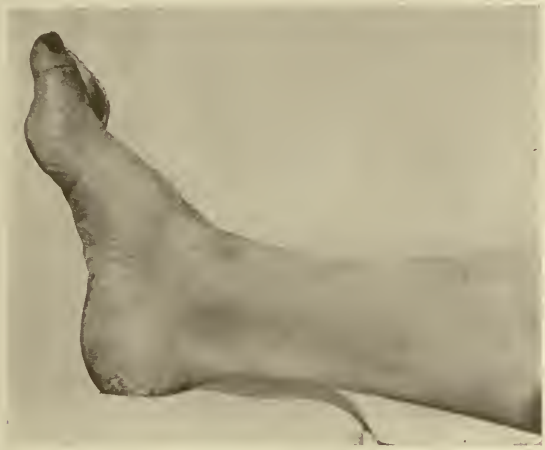

Fig. 404.—Photograph after operation. Note that the line of incision lies well to the lateral side of the dorsal surface of the great toe so as to avoid pressure from the shoe. Only the proximal part of the incision is to be made out. The distal portion of the incision does not show in the photograph.

the skin incision, and was accessible for the saw. With a Payr arthroplasty saw the head of the first phalanx was cut away, removing a fairly large piece of the phalanx with it. The second phalanx could now be easily extended without any force and tended to remain straight, showing no tendency to flex again. The sawn surface had purposely been made curved to simulate the head of the bone. Now the joint capsule and the divided tendon together were sutured with interrupted stitches of kangaroo tendon to close the joint capsule and repair the divided extensor tendon; by this means the ends of the two phalanges were held in accurate approximation and the toe was held straight. As both joint surfaces presented freshened bone, bony ankylosis was expected. Finally the skin was closed, using continuous and interrupted stitches of black waxed silk.

A dry dressing was put on and a plantar splint was applied to hold the toe slightly in extension.

The wound healed by primary union, and the patient was allowed to walk on the twenty-second day after the operation. I was surprised to find that there was some motion in the interphalangeal articulation. Today, twenty-five days after the operation, you see that the patient, who is now prepared to depart from the hospital, has a straight, movable, painless, useful toe (Fig. 404) in place of the incapacitating deformity with which he came to us.

HAMMER-TOE—MODIFIED JONES' OPERATION WITH DETAILS OF THE TECHNIC

THIS patient, a girl of sixteen, comes to the hospital because of pain in the right second toe, which is deformed. She states that the deformity began about one year ago, after she bumped the toe against a rock while in swimming.

The foot has been prepared for operation. You will notice that the other toes are all normal, though the distal phalanx of the right great toe curves upward somewhat. The second toe, as you see, shows the typical picture of a hammer-toe (Fig. 405), the proximal phalanx being strongly flexed upward and the second phalanx being acutely flexed plantarward, so that the head of the proximal phalanx projects strongly upward above the level of the other toes. As is the rule, also, you see there is a corn over the head of the proximal phalanx. In this case the corn is unusually large (Fig. 406). The third phalanx is ex-

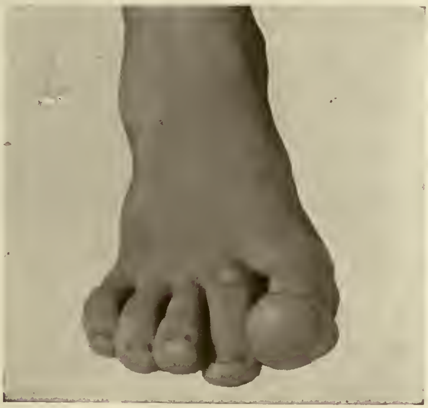

Fig. 405.—Hammer-toe of one year's duration in a girl of sixteen, who developed the deformity after bumping the toe against a rock while in swimming. Note the corn over the head of the first phalanx. The patient comes for operation because of pain. Photograph before operation. Anterior view.

tended in relation to the second phalanx, so that she does not bear her weight on the tip of this toe as is so often the case.

I have explained to the patient that I shall attempt to correct the deformity by removing the affected joint, but will probably not have to amputate the toe, and shall not do this unless it is absolutely unavoidable. As I explained when I showed you the other case of hammer-toe, *one should never amputate a hammer-toe unless all other operations are obviously impracticable*, and this is seldom the case. There is no hallux valgus in this case, but if the deformed toe were to be amputated one would certainly develop, and this would leave the foot more deformed than it now is and would cripple the patient more than the hammer-toe does. I shall perform a Jones operation in order to show you how simple it is, though I shall modify his technic slightly.

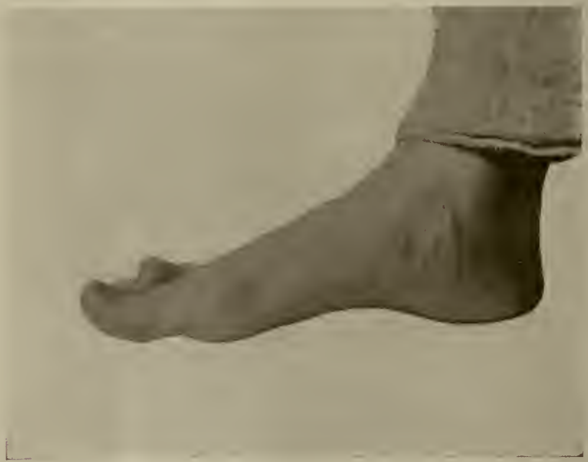

Fig. 406.—Photograph before operation. Lateral view. This shows the corn over the head of the first phalanx very plainly.

As I described this technic in detail when I showed you the first case, I need not repeat it now (see page 1089).

Operation.—The first step in this operation consists in excising the corn over the head of the first phalanx by means of an elliptic incision carried just beyond the corn, being careful not to extend the incision far enough lateralward on either side to cut the digital vessels. These do not come into view. In doing this, you see, I carry the incision boldly down to the bone, as there are no structures to be preserved. There is a bursa beneath the corn, and this I have excised together with the corn. The bursa does not communicate with the joint as is frequently the case. With a small thin periosteal elevator, curved so as to conform to the bone, I am freeing the soft parts from the bone all around the interphalangeal articulation, taking great care not to injure the digital vessels or the flexor tendon. Jones, in his description of his operation, says that the interphalangeal joint is resected by a wedge-shaped excision. I shall open the joint in this case, completely divide the capsular ligament and both lateral ligaments, and then shall separately resect the base of the second phalanx and the articular portion of the head of the first phalanx. You see that I am now dividing the dorsal portion of the joint capsule. In dividing the lateral portion of the capsule and the lateral ligaments I am very careful not to cut the digital vessels, and in order to avoid injuring them I direct the scalpel always toward the bone, and use the periosteal elevator as a retractor to hold the soft parts away from the joint. I am not going to divide the flexor tendon as Jones does, because in this case I believe after I have resected the ends of the bones I shall be able to straighten the toe without doing this, and that the flexion deformity will not tend to recur. I also feel that the flexor tendon will act somewhat as a splint, so that the joint will not be too flail-like.

Now that the two bones are free, I shall resect the joint surface of each bone in turn, removing the cartilage and only a thin layer of bone, so that the toe will not be too short. I shall first resect the base of the second phalanx and then the head of the first phalanx. In order to make the base of the phalanx accessible to the saw I dislocate it upward through my original incision, protecting the soft parts by retracting them downward and lateralward. I shall now resect the articular surface of the head of the proximal phalanx in a similar manner, at the same time holding down the distal portion of the toe to give better exposure.

Now that the articular surfaces are cut away, you see the toe can be straightened and remains straight. The flexion deformity does not tend to recur. The operation is practically bloodless and no arteries need to be ligated. Instead of using three sutures, going through all the soft parts, as Jones does in his closure, I shall suture the deep tissues and the skin separately. I put in all my deep sutures before I tie any of them. I shall now suture together the two cut ends of the extensor tendon. I shall first put in a mattress-suture of No. 2 chromic catgut to unite the cut ends of the extensor tendon, beginning at the proximal end. I shall now put in an interrupted chromic catgut stitch at either side of the mattress-suture. In addition, I shall put one interrupted chromic catgut stitch through the soft parts at either side of the tendon to take the place of the lateral ligaments, taking care to grasp in the bite the fibrous tissue and periosteum. I shall now tie each of these sutures. You see that when these are tied the distal portion of the toe is held straight and firmly in contact with the proximal part of the toe. I shall now put in the skin sutures. I shall first put in a few interrupted stitches of No. 3 black waxed-silk. These three will suffice. Now I shall

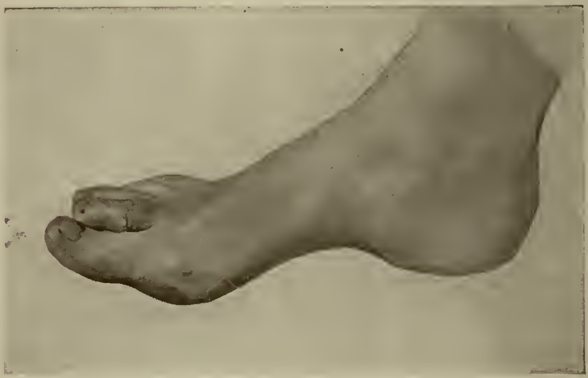

Fig. 407.—Photograph of the same case four days after a somewhat modified Jones' operation. Note the line of incision and the interrupted sutures still in place. Primary union. As a result of the resection the second toe is shorter than the middle toe, and is just about the same length as the fourth toe. There is no hallux valgus and none will develop, as would happen in case the deformed toe had been amputated.

put in, in addition, one interrupted stitch of No. 1 plain catgut between each of these silk stitches. These six stitches are all that are required, and, as you see, the apposition is accurate and the toe looks fairly normal. I shall now put on a simple dressing of plain gauze, and shall hold the toe immobilized on this small splint of the Jones type, which I described when I showed you the previous case. If the patient has no rise in temperature or no unusual amount of pain in the toe the dressings may be left in place for eight or ten days without inspecting the wound, and at the end of this time the silk stitches will be removed. The patient will not be allowed to walk until the end of three weeks.

Postscript.—In this case the dressings were removed on the fourth day in order to take a photograph to show the incision and the sutures in place (Fig. 407).

CLINIC OF DR. KELLOGG SPEED

COOK COUNTY HOSPITAL

HEMATURIA IN APPENDICITIS

Summary: Hematuria in 7 out of 13 male patients with appendicitis; other reported cases; possible causes of the condition; importance of a local ureteritis; diagnosis; sequelæ—possibility of organic ureteral stricture.

MEDICAL teaching has always laid stress on the importance of hematuria in calculus of the urinary tract or in lesions involving solely the genito-urinary system. In the last two months I have had 13 male patients admitted to my service with a diagnosis of an acute or subacute appendicitis. All have been operated on and, of course, all have been given the customary careful urinary examination. This examination must always include microscopic inspection. Seven of these patients have presented blood in the urine at the time of admission, and the prevalence of this finding in appendicitis warrants my calling it to your attention. I can only show you one of these patients (Case I); nevertheless I shall present to you the essential facts concerning each of the remaining six as I find them in the hospital records.

CASE I.—This man is twenty-seven years old. He entered the hospital with the customary history of an acute attack of right-sided abdominal pain preceded one week by a cold, chest pains, and a cough. The first abdominal distress was epigastric, but it moved down quickly to the right iliac region, and in the afternoon of the first day the pain radiated down into the right side of the scrotum, causing the patient to double up. There was no previous history referable to the urinary tract except that he recalled passing bloody urine for about a week when eight years old. Kidneys not palpable or tender; muscular rigidity low down in right iliac fossa.

On admission the urine showed 100 red-blood corpuscles to a low-power field, a few white blood-corpuscles, and hyaline casts with débris; albumin, a trace. Leukocyte count, 11,700. Just before operation another urine examination was made which confirmed the finding of red cells in an acid urine. After appendectomy the hematuria promptly ceased.

Operative Pathology.—A subacute, rigid, and thickened appendix was found buried deeply in the iliac fossa. No peritonitis, but the serosa of the cecum was injected and the sigmoid had moved over on to the right side.

Case. II—F. S., No. 624,670, twenty-four years old, entered February 14, 1917; discharged March 3, 1917. He gave the customary history of onset with no previous trouble. The first pain was low down on the right side. He had worked and been quite constipated. A mass could be felt in the right iliac region, and the rigidity and tenderness there present extended back into the lumbar region. Genito-urinary history negative.

Urine examination showed 200 red blood-corpuscles to a low-power field; alkaline reaction; no albumin and a small amount of débris present. Leukocyte count, 12,400.

Operative Pathology.—A retrocecal appendix was found lying in a small abscess walled off by bowel and omentum. The appendix was gangrenous with inflammation of the surrounding intestinal surfaces. Appendectomy and drainage, followed by prompt disappearance of the hematuria.

Case III.—M. Z., twenty-two years old, admitted February 21, 1917; discharged March 5, 1917. Customary pain history with constipation. He had been sick really about four weeks, but did not vomit. The appendix region was quite sore and there were no symptoms in the urinary tract. The urine showed acid, no casts, numerous red-blood cells and a few white blood-cells. Leukocyte count, 8600.

Operative Pathology.—The appendix was fixed anteriorly by a few thin adhesive bands. The organ was long and indurated, moderately inflamed, its base *lying low down and far back*, much thickened.

After appendectomy the hematuria disappeared.

Case IV.—F. D., fifty-one years old, admitted January 11, 1917; discharged two weeks later. Readmitted January 29, 1917.

His attack consisted of right iliac pain and dizziness with a negative previous history. Four days before admission he had been seized with a severe pain in the right abdomen which occasionally passed into the right testis. He vomited, and after two days the pain gradually subsided, but tenderness on the right side persisted. Just before admission the pain had begun again, extending into the right testis and lumbar region, with subsequent vomiting. He had fever in both attacks, with chills in the last. Urination was regular and normal and no blood was noticed in the urine. Gonorrhea twenty-five years ago.

The urine showed acid, no albumin, 50 red blood-corpuscles to each low-power field, and a few white blood-cells. Leukocyte count, 11,600.

Operative Pathology.—Appendectomy. Subacute catarrhal appendicitis, erectile type. The tip of the appendix was retrocecal. The mucosa was deeply injected and there was no pus or fecolith present.

He recovered symptomatically and was discharged, hematuria having disappeared.

Readmitted, saying that four days after leaving the hospital he had been seized again with the same severe attack of pain in the right side. This radiated to the left side and not downward. Nausea, vomiting, and fever of 100.4° F., with sweats and chills present. Rarely the pain could be felt in the scrotum and there was marked tenderness in the lower right abdomen. When deep pressure was made over the right kidney, pain, radiating into the left side of the abdomen, developed. Wound clean, healed, and not tender. One could not be certain that the right kidney was palpable.

Urine examination: Acid, no albumin, a few white blood-cells. Stomach contents and feces negative. Because he had slightly irregular pupils a Wasserman was made. It was negative.

Cystoscopic examination January 31, 1917: The posterior urethra was somewhat lengthened, the bladder mucosa showed no change, and was very tolerant to both fluid and instrument. Ureteral orifices—catheter passed to left kidney, but ureter did not allow entirely free passage. Left orifice—no change. Right orifice showed an increase of blood-vessels and a distinct blush of the mucous membrane inferiorly. On attempted catheterization the catheter would pass up only 1 cm. Filiforms and numbers 4, 5, or 6 would not pass. The conclusion was drawn that the ureter was markedly spastic or that an organic obstruction was present. The appearance of the orifice was not at all suggestive of foreign body, there being no edema or orificial elevation.

Rest in bed with active catharsis was ordered. By February 2, 1917, a No. 6 catheter could be passed to the pelvis of the right kidney, meeting with no serious obstruction. No stone was found or passed. The patient was discharged February 19, 1917, free from pain and improved. No hematuria, the ureteral stricture being probably secondary to the perityphlic inflammatory process.

Case V.—A. N., No. 620,245, eighteen years old, admitted January 4, 1917; discharged January 19, 1917. He had the customary history of right-sided pain with sudden onset, first in the epigastrium, followed by vomiting and localization in the right flank. This was the first attack, the previous history being negative. On the right side the muscles were very rigid and there was tenderness in an area the size of one's palm over the usual appendix region. Considerable rigidity, extending into the right lumbar region. Kidneys negative.

Urine examination: Acid, no albumin, fair number of both red and white blood-corpuscles. Leukocyte count, 16,600.

Operative Pathology.—The appendix, suppurating and gangrenous at tip, lying deeply behind cecum, was delivered with difficulty. Just beyond edge of mesenteriolum was a small perforation. No fecal concretion in the lumen, but there were several deep ulcers present. Diffuse serofibrinous and purulent peritonitis with no attempt at walling off by surrounding viscera. Appendectomy and drainage.

Urine examination three days later showed alkaline reaction, otherwise negative. Hematuria and other symptoms remained negative until discharged.

Case VI.—M. G., No. 622,455, thirty-three years old, admitted January 25, 1917; discharged February 14, 1917. He told a story of dull aching pain at the pit of the epigastrium and right side of abdomen, with a poor appetite and loss of weight. Three months before admission he had experienced a sharp attack which doubled him up, caused vomiting, and sweats lasting three days. His abdomen remained tender, and one month before coming to the hospital he had a second attack of four days' duration. Past history was negative. Genito-urinary symptoms entirely negative. A small mass could be felt low down in the right flank and the rectal examination showed a slightly enlarged prostate.

Urine examination showed an alkaline reaction, trace of albumin, 30 red blood-corpuscles to $\frac{1}{6}$ field, and a few white blood-cells. Leukocyte count, 9000.

Operative Pathology.—An abscess of thin fetid pus was found deep down around the head of the cecum which was fairly well walled off by the injected bowel. No general peritonitis existed. The appendix could not be located. Drainage. A fecal fistula developed, but rapidly closed. Inside of three days after operation blood disappeared from the urine and was not found subsequently.

Case VII.—F. C., No. 622,684, twenty years old, admitted January 27, 1917; discharged February 11, 1917. Sudden onset with right abdominal cramp-like pain. Previous history negative except for a specific urethritis a few months ago. Urine acid; albumin, trace; 10 red blood-corpuscles and about 50 white blood-corpuscles to $\frac{1}{6}$ field. Leukocytes, 34,000.

Operative Pathology.—There was a deep lying partially gangrenous appendix surrounded by a walled-off abscess cavity. Appendectomy and drainage.

Following operation the hematuria disappeared and there were no signs of an active urethritis.

Hematuria, after all, may not be so uncommon in appendiceal attacks. Noble in 1897 (Annals of Surgery, xxv, 187) reported an instance in which the ureter was involved in appendiceal inflammation. The patient, a twenty-three-year-old male, had an attack simulating renal colic, in which there was nausea, vomiting, and retraction of the right testicle, but no hematuria, nor was calculus passed, although there was three years' observation. Attacks happened every two or three months and eventually stone in the pelvis of the kidney was diagnosed. The kidney was opened, but no stone was found. The operator's finger passed down the ureter felt a thickened mass, and through a separate abdominal incision a long thick appendix, which pointed up and backward, with its tip adherent to the posterior peritoneum over the right ureter, was found. This was removed and the colic ceased. Tuffier in 1899 (Semaine Med., 1899, 265) cited an instance of similar attacks of three years' duration in which he found a long-standing appendicular inflammation which had caused an intimate fusion to the right ureter. Appendectomy affected a cure. Thorburn (Med. Chron., 1901, 116) reported 2 instances of appendicitis with hematuria in boys aged fourteen and nine years. One had abdominal fecal fistula, the other a large abscess, and in both the severe hematuria disappeared after operative interference. He thought that the large mass of the appendiceal abscess might cause hematuria by pressure on the renal vein. Gardini (Gazz. d. Ospedali e. d. Chiriche, Milano, 1902, 567) mentioned 2 patients in whom diagnosis was difficult, both with hematuria, but both later passing stones. Baradulin (Moscow Monatsberichte f. Urologie, 1904, 703) discussed this subject, but considered that the proximity of the appendix to the bladder was the cause of most hematuria in appendicitis.

The causes of appendicular hematuria may be briefly outlined as follows:

I. Local:

- (*a*) *Peri-ureteritis* in appendiceal area—hyperemia of mucosa with blood leakage into urinary stream.
- (*b*) *True ureteritis* from direct extension. Appendix chronically adherent to ureter or ulcerated into ureter by abscess or intense neighboring inflammation.
- (*c*) *Pericystitis*—appendix near to bladder wall—same pathology as (*a*).
- (*d*) *True cystitis* from extension as in (*b*).

II. General—dependent on the appendicular inflammation:
  (*a*) Septic infarcts in kidney, ureter, bladder, or prostate.
  (*b*) Toxic hematuria.
  (*c*) Lighting up of old urethritis or cystitis by acute febrile attack.

Any of these causes may act. I believe that the majority of the instances of bloody urine in appendicitis can be traced to the local peri- and true ureteritis. Most of the patients mentioned here were not intensely toxic. Only one had suffered a recent urethritis and the appendices were mostly deep and adherent over the ureteral course. I have had several patients with masses of abscess or inflammation palpable via the rectum, some with an appendix adherent to the bladder wall, but all without hematuria. Not one of this series of 7 patients gave evidence of septic kidney infarcts, and in the one cystoscopically examined the bladder mucosa was normal. The prompt recovery after appendectomy proves rather conclusively that local ureteritis is the cause of most of these attacks of hematuria accompanying the appendicitis.

Diagnosis must consider, of course, kidney and ureteral stone and new growths, cystitis and pericystitis, abscess rupturing into the bladder, stone and new growths in the bladder, as well as prostatic, seminal, and urethral lesions. Cystoscopy is of great help.

As a rule we may consider that the sequelæ are of little danger. Patient No. 4, cited here, probably developed a ureteral stricture of very mild degree from the inflammation. The condition may have been merely spasm, but the obstruction felt organic. Ulceration of the ureteral wall might lead to urinary extravasation into the peri-appendiceal area or abscess, to be followed by a urinary fistula when the abscess is opened. We know clinically, however, that wounds of the ureter tend to close naturally in a brief time if given half a chance. I cannot recall having heard of an instance of urinary fistula following the opening of an appendiceal abscess, although infections of the kidney, ureter, or bladder are possible following such a lesion and do sometimes occur.

SURGICAL CLINICS OF CHICAGO

Volume 1 Number 6

CLINIC OF DR. DEAN LEWIS

PRESBYTERIAN HOSPITAL

SEPARATION OF THE LOWER EPIPHYSIS OF THE FEMUR WITH ANTERIOR DISPLACEMENT AND T-FRACTURES

Summary: Two patients illustrating the mechanism of the production, the characteristic deformity, and the difficulties in the management of separation of the lower epiphysis of the femur; one patient with T-fracture of the lower end of the femur; treatment by open operation; effects of nails and screws in joint surfaces.

TRAUMATIC separation of the lower epiphysis of the femur is usually due to hyperflexion or hyperextension of the knee-joint. It is probably most frequently caused by torsion of the leg when the latter is extended. The 2 cases which I wish to show this morning, in connection with the case about to be operated upon, illustrate well the mechanism of the fracture.

CASE I.—This girl, ten years of age, gives the following history: In March, 1915, she fell from a vehicle while riding to school. Her heel was caught between the spokes of a revolving buggy wheel. She was thrown to the ground and dragged some 40 feet before she was freed from the wheel, when her shoe was torn off. She sustained at this time a separation of the lower epiphysis of the femur. An attempt at reduction was made at this time, and immobilization was maintained for fifteen weeks. After removal of the immobilizing dressings the child had but little use of the leg. The displacement had not been reduced. In September, 1915, an open operation was performed to reduce the deformity, and immobilization was maintained for six weeks. This operation was not successful, as the motions at the knee-joint are limited, and the foot is turned inward to an angle of almost 45 degrees as a result of displacement, with torsion of the epiphysis. Flexion of the knee-joint is limited to about 30 degrees by the lower end of the upper fragment, which projects into the popliteal space, and can be easily felt beneath the skin. The *x*-ray picture reveals the anterior displacement of the epiphysis and the projection into the popliteal space of the lower end of the upper fragment (Fig. 408). In the anteroposterior view some idea of the rotation of the epiphysis is given. No epiphyseal line is seen in the picture, and judging from this it seems quite probable that the epiphyseal cartilage has become ossified (Fig. 409).

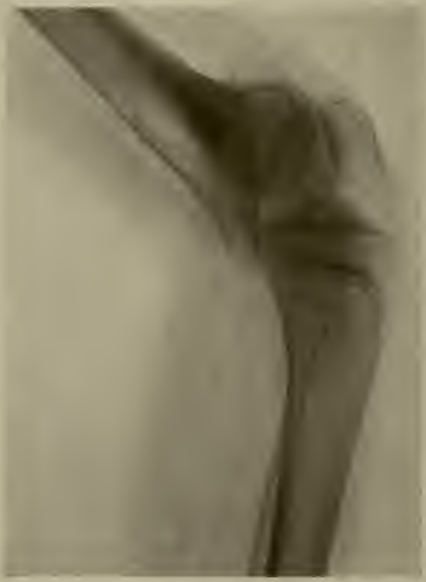

Fig. 408.—Case I. Note displacement of epiphysis and projection of upper fragment into popliteal space.

On June 27, 1916, an operation was undertaken with the view of replacing the epiphysis and removing if necessary the fragment projecting into the popliteal space in order to increase the amount of flexion at the knee-joint. Correction of the displacement was rendered necessary in order to correct the torsion of the leg which caused an inward rotation of the foot to an angle of almost 45 degrees.

Under ether anesthesia an incision measuring 4 inches in length was made on the outer side of the thigh, extending upward from the line of the knee-joint. The incision was carried down to the bone, the lower end of the upper fragment and the displaced epiphysis being exposed. When the displaced epiphysis was exposed it was chiselled free from the shaft. It was impossible to replace this until the end of the fragment projecting into the popliteal space was resected. When this was removed and the knee partially flexed the displaced fragment could be slipped back into position. A small Lane plate was employed to maintain fixation of the epiphysis with the shaft. A plaster-of-Paris cast was applied after the incision was closed, the knee-joint being slightly flexed. Immobilization was maintained for six weeks.

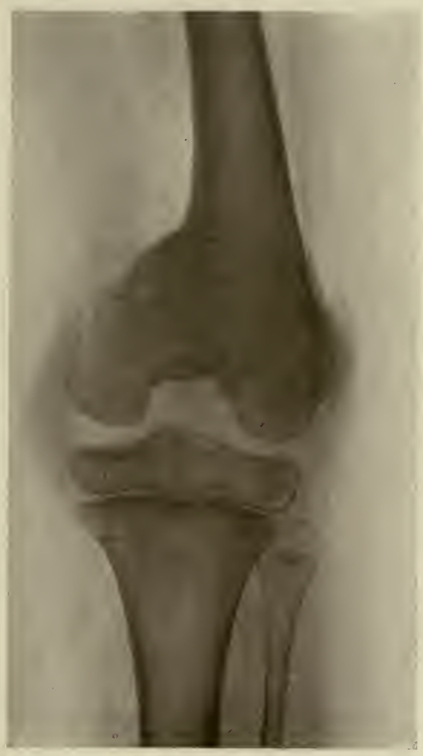

Fig. 409.—Case I. Displacement and rotation of epiphysis well shown. Healing has occurred with obliteration of epiphyseal line.

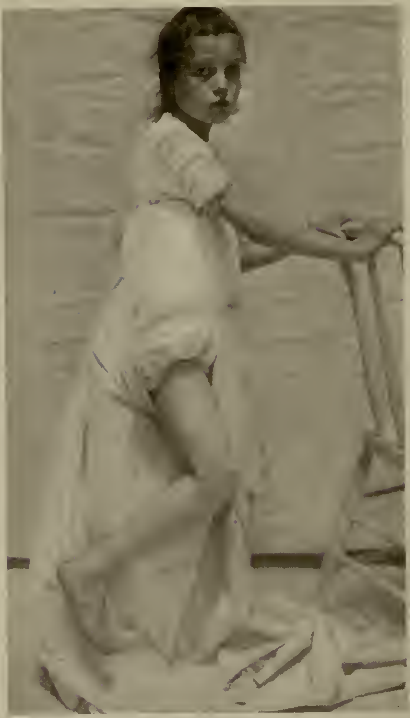

Fig. 410.

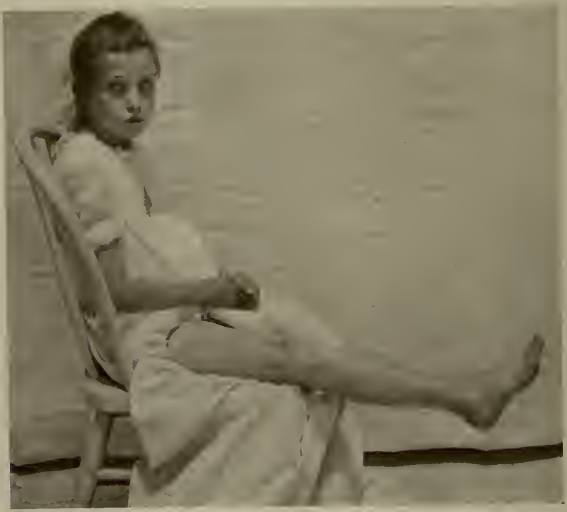

Fig. 411.

Figs. 410 and 411.—Case I. Range of motion obtained after open operation.

It is now thirteen months since this patient was operated upon. She has good use of the knee-joint. Flexion to about 85 degrees is present (Fig. 410), and the knee can be almost completely extended (Fig. 411), and the displacement of the foot due to rotation of the epiphyseal fragment has been corrected. There is a shortening of $1\frac{1}{4}$ inches, which necessitates a high sole and heel. The lower epiphysis takes a very active part in the growth of the femur, and I am afraid that the shortening will increase as the child grows, as the *x*-ray examination would seem to indicate that the epiphyseal cartilage has undergone ossification (Figs. 408 and 412). The function of the extremity has been greatly benefited by the operation, for the gait is practically normal. It is impossible to estimate how much shorter the extremity will become as the child grows. The epiphyseal line is obliterated, and it is more than likely that all growth at that line has ceased.

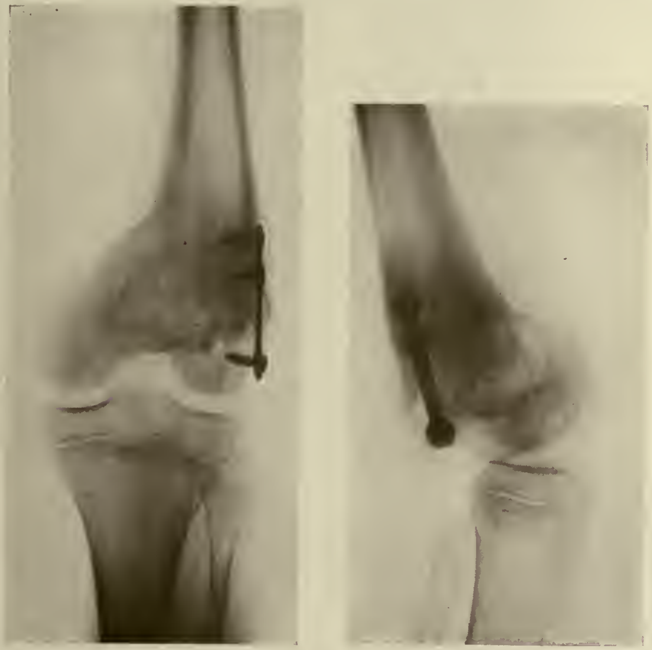

Fig. 412. Fig. 413.

Figs. 412 and 413.—Case I. Roentgenogram after operation. (Compare with Figs. 408 and 409.)

Case II.—This boy, thirteen years of age, was injured on the 28th of July, 1916. The seat of the buggy in which he was riding was narrow, and he was crowded off of it and fell between the body of the buggy and the wheel. His right leg was caught between the spokes. The horse was stopped almost at once and the boy's foot released. The leg could not be straightened out, and severe pain was experienced about the knee-joint.

When examined, twelve days after the accident, the right leg was found to be held in partial flexion. Attempts which were made to straighten it caused severe pain and were unsuccessful.

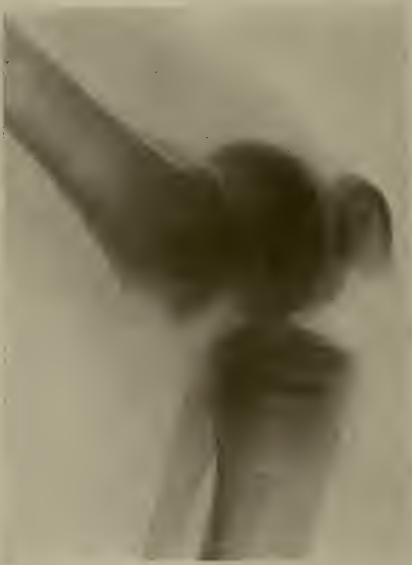

Fig. 414.—Case II. Roentgenogram showing separation of epiphysis. Notice projection of upper fragment into popliteal space.

The knee-joint was tender and swollen. A hard mass, the lower end of the upper fragment, could be felt in the popliteal space. The patella was in place, but above it a defect in the line of the femur could be made out.

The x-ray examination revealed a separation of the lower epiphysis with anterior displacement and some rotation (Fig. 414). The operation performed upon this patient with the view

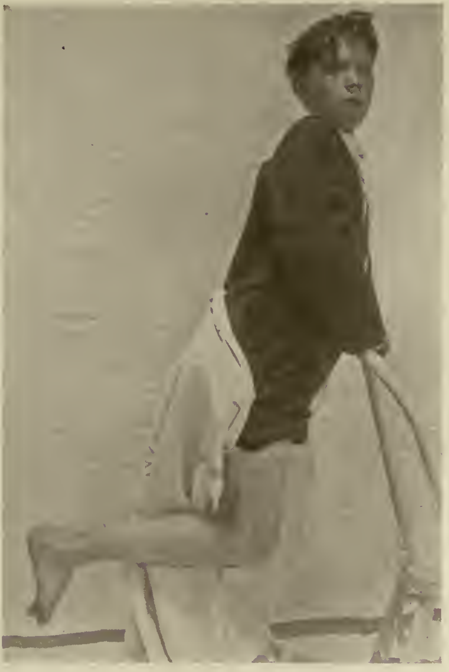

Fig. 415.

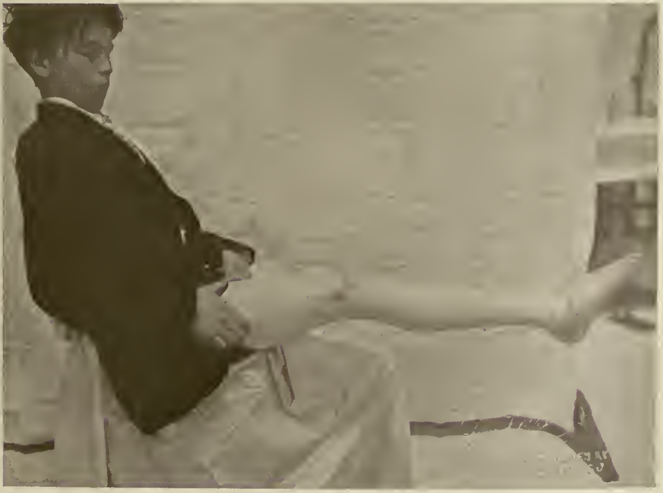

Fig. 416.

Figs. 415 and 416.—Case II. Result of treatment—almost normal range of motion.

of reducing this displaced epiphysis was performed thirteen days after the injury. As you see, a longitudinal incision measuring 6 inches in length was made over the outer side of the thigh and somewhat anteriorly. It extended below to the line of the knee-joint. The site of the fracture was exposed and the displaced fragment was found lying anteriorly. This fragment could be easily reduced when the knee was flexed, but reduction was difficult or impossible when the knee was extended. With the knee flexed the dislocated epiphysis was reduced and held in position by a small Lane plate. An immobilizing plaster-of-Paris dressing was then applied, the knee being semiflexed. One week after the operation the stitches were removed and the wound seemed clean. At this time an attempt was made to extend the knee, but the lower fragment apparently slipped some when this

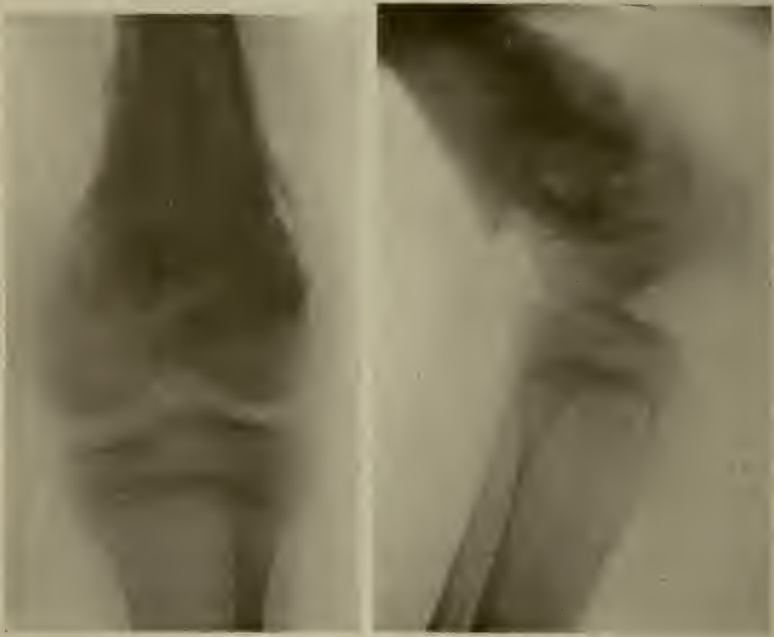

Fig. 417. Fig. 418.

Figs. 417 and 418.—Case II. Roentgenograms after completion of treatment. (Compare with Fig. 414.)

was attempted, and some flexion was maintained until bony union was well advanced.

This patient went home and subsequently had a mild diphtheria. This was contracted at home, and after the wound had been clean for some time a mild infection developed, necessitating removal of the plate. It required a long time for the infection to develop if it was introduced at the time of operation. In view of the fact that it developed so late, I am inclined to believe that this was a hematogenous infection, developing at the locus minoris resistentiæ, where the plate was inserted.

A year after the operation the boy has almost complete function of the knee-joint, all motions being of practically normal extent.

Dr. Montgomery has recently reviewed the literature dealing with separation of the lower epiphysis of the femur with anterior displacement. Of the 27 cases collected by him, including the 2 which you have just seen, 22 occurred in boys and 2 in girls. In three instances the sex was not mentioned. In 18 of the cases the injury was caused by the leg being caught in a revolving wheel or in machinery, while in 7 cases the fracture resulted from falls or as the result of direct injury. The average age of the patients was 10.9 years. The youngest age at which this type of fracture is reported is eighteen months; the oldest, twenty years. In six instances the fracture has been compound.

Open reduction of this type of fracture is, I believe, the method of choice, for it would seem to be practically impossible to reduce this fragment by the ordinary methods of manipulation and subsequent immobilization. Acute flexion may be tried, but in the case under consideration the fragment could not be reduced and maintained in reduction until the fracture was exposed. The epiphysis could be easily reduced after the knee was flexed, when direct manipulation could be combined with acute flexion. Even after fixation with a Lane plate it seemed to be advisable to maintain some degree of flexion at the knee-joint, for there was a tendency for the fragment to be displaced somewhat when extension was attempted.

It is interesting in this connection to review the different methods which have been resorted to in treating this type of fracture.

Amputation has been resorted to in 14 of the 27 cases recorded. In 9 of these cases amputation was deemed advisable because of the extent of the damage sustained at the time of injury; in 5 cases because of hemorrhage, infection, or an aneurysm developing in the popliteal space. In some of the cases in which proper alignment of fragments could not be obtained by the open method, resection has been resorted to. In these cases good results were obtained, but in a case recorded by Alcock, union occurred late with the leg at an angle of 75 degrees with the thigh. As shortening follows this operation, it should only be employed in those cases in which the fragments cannot be brought into alignment by the open operation, and when the deformity and disability resulting from failure to reduce the displacement would be greater than that resulting from shortening of the extremity. In 2 cases (Atkinson) excision of the knee-joint has been resorted to. This operation is indicated only when the structures entering into the formation of the knee-joint are so badly damaged that the results following reduction of the displacement would be *nil*.

CASE III.—This patient was admitted to the hospital five days ago. One and a half hours before admission he was injured while riding a motorcycle at the speed of 20 miles an hour. He ran into an automobile going at about the same speed. He remembers the crash, and believes that the motorcycle fell upon his left leg. After the fall he became unconscious, but regained consciousness on the way to the hospital.

When the left thigh was examined a false point of motion could easily be demonstrated just above the knee-joint, which was already markedly swollen. Several small abrasions were found over different parts of the body, one being located to the inner side of the knee-joint. There were no evidences of an injury to the skull or back.

An *x*-ray examination made the following morning revealed a T-fracture of the lower end of the femur, the lower end of the shaft of the femur being displaced anteriorly, and the condyles, fairly widely separated by a line of fracture, being displaced backward (Figs. 419 and 420).

Because of the abrasion about the knee-joint an open operation has been postponed up to the present time. During the five days since the injury an attempt has been made to keep the fragments approximated by traction, the knee-joint being somewhat flexed. The attempts which have been made to approximate the fragments by the ordinary methods have been unsuccessful, and as the abrasions which were received at the time of the accident are clean and covered over, we shall attempt an open reduction of the fracture.

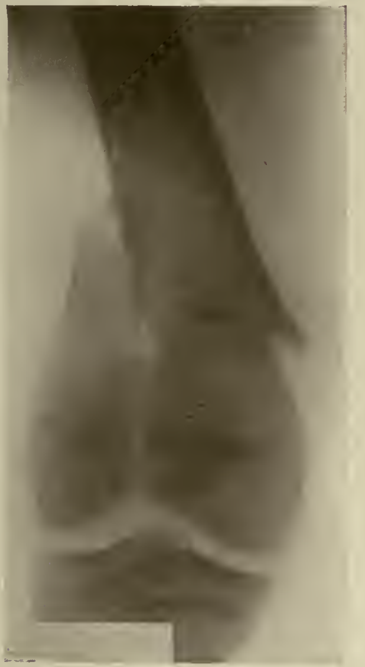

Fig. 419.—Case III. T-fracture, anteroposterior view.

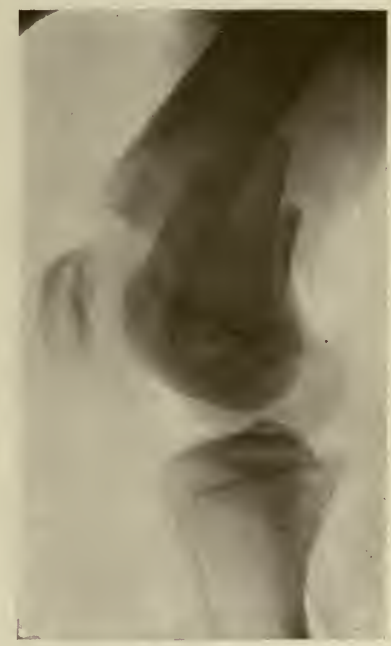

Fig. 420.—Case III. T-fracture, lateral view.

An incision measuring from 6 to 8 inches is made over the junction of the outer and anterior aspects of the thigh. This is carried down to the seat of fracture. The soft tissues have been injured considerably and there is a large hematoma. The condyles are separated. The fracture through the junction of the shaft and condyles is almost transverse. The shaft has apparently acted as a wedge which has split the condyles apart as the force which caused the transverse fracture continued to act.

It is impossible to reduce this fracture unless the condyles are first united, for any attempt to bring the shaft in line with the condyles forces the latter apart, rendering reduction of the deformity impossible. The separated condyles can be easily brought together. I shall fix these by driving a steel wire nail transversely through the two condyles while they are held in apposition. When the condyles are fixed the shaft can be easily brought into alignment, for the fracture has caused a small wedge-shaped de-

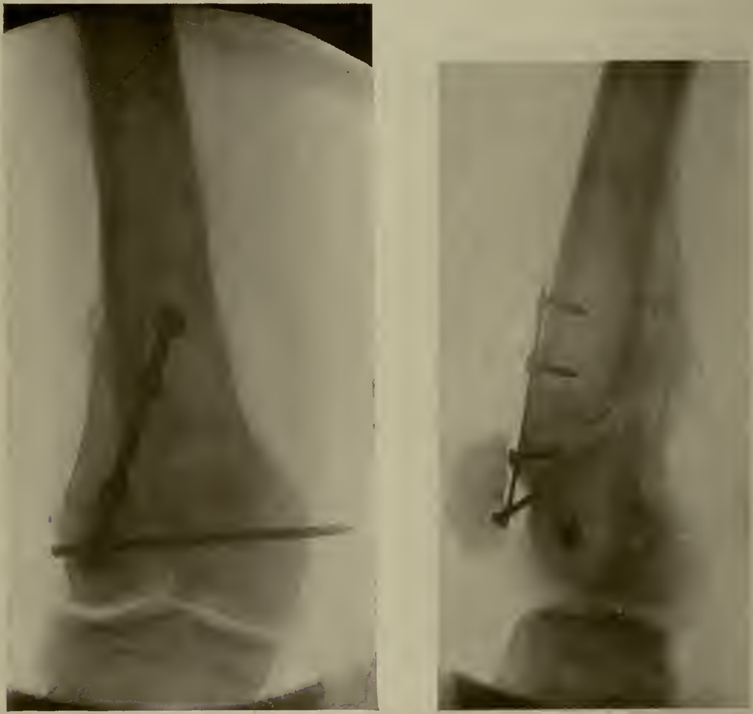

Fig. 421. Fig. 422.

Figs. 421 and 422.—Case III. Roentgenogram taken a few days after reduction by open operation. (Compare with Figs. 419 and 420.)

fect between the condyles into which the lower end of the shaft fits snugly. The shaft will be maintained in position by a Lane plate. It is difficult to apply this plate to the outer part of the shaft because of the contour of the external condyle. The plates will, therefore, be placed upon the anterior surface of the femur, the lower end being fixed upon the outer rim of the external condyle, well away from the patella, so as not to interfere with the patella during movements of the joint. Almost perfect apposition of the fragments can be secured after the condyles are nailed together (Figs. 421 and 422).

It is more than probable that the nail which has been used to fix the condyles will have to be removed subsequently. I have used these nails frequently to maintain fixation of bony fragments, and in the majority of cases I have had to remove them, for they have worked out to the skin. They can easily be removed under local or gas anesthesia.

Relative to the use of the plate in this case, and the position in which it is applied, I should like to quote some conclusions reached by Mann concerning the effects of nails and screws in joint surfaces.

Mann believes that nails and screws are tolerated in joint surfaces in the human as well as in experimental cases with surprisingly little reaction. They became and remained firmly embedded in the specimens obtained by him after experimentation. In every case where the nails and screws projected above the joint surface a distinct up-building of the condyle occurred. This increase in the joint level, seems to be due always to a growth of bone, and not to an increase in the thickness of the cartilage. In each case where tissue grew across the head of the nail or screw or across the groove of the screw the new tissue showed a reversion to the connective-tissue type. In his experiments the dogs ran about normally after a short convalescence, when the nails or screws remained more or less uncovered. In these cases the scratch or groove on the opposing surfaces was filled in as the projection of the nail or screw was lessened by the upbuilding of the condyle.

I do not believe that the plate which has been inserted will interfere much with the function of the joint, for an effort has been made to place it well to the outer side of the joint cavity and away from the patella. While it is not frequently necessary to place a plate where it might interfere with joint functions, such occasions do arise, as is indicated by the case now under discussion.

In this connection I would like to quote verbatim the conclusions which Mann arrived at after experimental work concerning the effects of nails and screws in joint surfaces. These are as follows:

1. Nails and screws are tolerated in joint surfaces in the human as well as in the experimental cases, and with surprisingly little reaction.

2. They remained firmly embedded in every specimen recovered.

3. In every case where the nails and screws projected above the joint surface there was a distinct upbuilding of the condyle as nature's reply to a rigid metal body projecting into the joint.

4. It is exceedingly interesting to find that the increase in joint level seems always due to the growth of bone, and not to the increase in the thickness of the cartilage.

5. In each case where tissue grew across over the head of a nail or screw, or across in the groove of the screw, the new tissue showed a reversion to the connective-tissue type.

6. Even when the nails and screws have remained more or less uncovered the dogs have run about normally after a short convalescence.

7. In each case the scratch or groove on the opposing surfaces was filled in as the projection of the nail or screw lessened by the upbuilding of the condyle. The defect was apparently entirely filled in all but one specimen, and this was closing in nicely at the end of six weeks.

8. As a point in technic it seems better to swing a hinge-joint freely at the time of the operation in order to scratch the groove made necessary by a badly placed nail or screw, and thus save the time and pain during convalescence which would be required in scratching the groove little by little later.

MYOSITIS OSSIFICANS DEVELOPING IN A CLEAN INCISED ABDOMINAL WOUND

Summary: A patient who developed a hard, bone-like mass in a clean incised wound within seven weeks after operation; diagnosis of circumscribed ossifying myositis; etiology—rarity in clean incised wounds; prognosis—ultimate absorption if left alone.

This patient is twenty-seven years old. For over a year he has experienced from time to time an aching pain in the epigastrium which would develop early in the evening and last for half an hour or somewhat longer. At times the pain would develop at 1 or 2 o'clock in the morning, and last two or three hours. At no time has nausea been experienced and there has been no vomiting. Bismuth at first gave relief. During a few weeks before the patient entered the hospital the pains were experienced during the day, and lately he has had almost continuous pain and distress, which has varied considerably in intensity. If he remained upon a liquid diet the distress could be controlled to a considerable extent.

The patient has had several attacks of acute arthritis during the past year. The general examination is negative except as regards the heart. The apex-beat is in the seventh intercostal space, two fingerbreadths external to the nipple line. The impulse is heaving. A loud diastolic murmur is heard over the base of the heart which is transmitted to the apex. The patient has a distinct aortic regurgitation, but the heart is compensated.

A test-meal revealed no retention of food. Total acidity of gastric juice is 95; free HCl, 50. Occult blood has been found in the stool from time to time. The patient has a typical history of duodenal ulcer, and on June 15, 1917, a posterior no-loop gastro-enterostomy was performed, the pylorus being temporarily occluded by plication with two silk sutures. The postoperative course of this case was very smooth, no vomiting or distress being noted. Following the operation a temperature was noted for four days. On the third day it reached 102° F. It subsided quickly and did not recur. During this rise in temperature there was no inflammatory reaction in the abdominal wall around the incision. The temperature was thought to be due to a bronchitis, never severe, from which the patient suffered at this time.

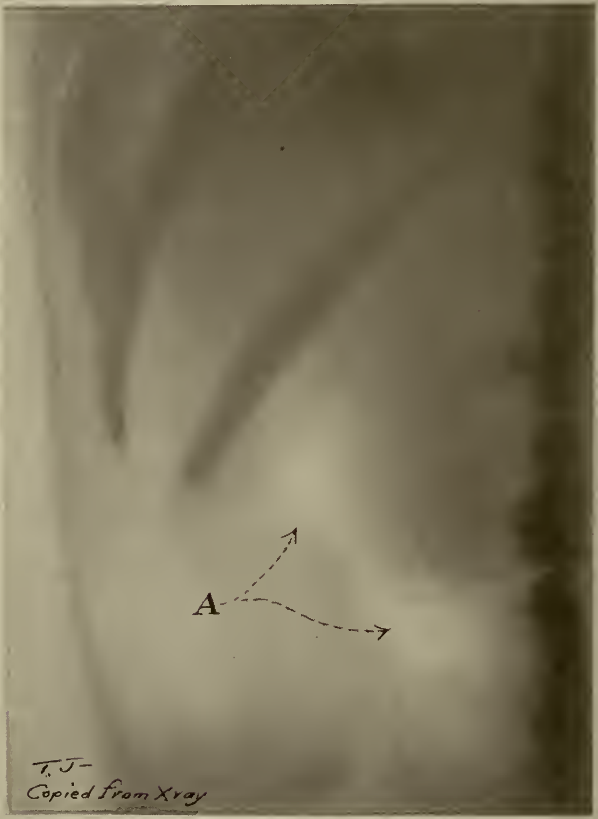

Fig. 423.—Copy of *x*-ray picture, showing approximate size and location of the region of ossification (*A*) in anterior abdominal wall.

Patient left the hospital thirteen days after the operation, much relieved, the pain and distress following the taking of food having completely disappeared. After going home a cough developed which bothered him considerably. About three weeks after the operation the patient noticed some tenderness in the scar. The tenderness was so marked that the patient could not wear a belt without causing him considerable discomfort.

A little over seven weeks has now passed since the operation, and there is felt the whole length of the scar a definite mass measuring a fingerbreadth or more in width. This mass occupies the site of a wound in which there has been no suppuration and no crushing of abdominal muscles. At the present time the scar is but slightly tender and causes no discomfort.

An *x*-ray reveals a distinct shadow upon the right side, corresponding to the mass which can be felt in the abdominal wall. The shadow is much larger than would be expected from the findings elicited by palpation (Fig. 423).

The mass which can be felt has the consistency of bone, and I believe that this is a case of ossifying myositis developing in a clean incised abdominal wound.

Etiologically, circumscribed ossifying myositis may be divided into the traumatic and non-traumatic forms, and into those associated with defects of or diseases of the central nervous system, such as spina bifida, tabes, syringomyelia, transverse myelitis, and paretic dementia.

The majority of cases of circumscribed ossifying myositis are not caused by repeated injuries, but follow one severe injury caused by blunt force in which there is considerable laceration of muscle-fibers associated with hematoma formation. Of the 296 cases of ossifying myositis collected by Schulz, not less than 232 gave a history of one severe injury caused by blunt force. Such injuries are dislocations, especially dislocation backward of the elbow, dislocation of the clavicle, and shoulder. This process may follow the bite or kick of a horse, a fall upon an object with sharp corners, upon a wooden or steel beam, or a muscle injury caused by excessive or unguarded muscular action during athletic sports, such as football, baseball, or tennis.

This case is of especial interest because the ossifying process followed a clean incised wound of the abdominal wall in which there was no noteworthy reaction during the process of repair. In an article published by Küttner in 1910 dealing with circumscribed ossifying myositis, he states that he could find but 5 cases recorded in which the process followed a wound caused by a sharp instrument, producing a clean incised wound.

Bender reports a case in which bone developed in the biceps brachii after a punctured wound with a darning needle; Schwarz, a case in which bone developed in the glutei muscles after they had been cut with glass, glass being found embedded in the bone. Werner described an ossifying process in the biceps after a punctured wound. Cranwell described 2 cases in which bone developed in the muscles after an incised wound. In one instance the patient, aged twenty-seven, was whittling, when the knife slipped and pierced the inner part of the thigh, passing through the adductor group of muscles. There was considerable hemorrhage, but the wound healed rapidly. After some months a piece of bone of considerable size developed in the adductor muscles. This was later removed. The second case reported by Cranwell occurred in a man aged twenty-two. Three months before he was operated upon he sustained a stab-wound of the thigh. There was considerable hemorrhage. The wound suppurated and healed slowly. Soon a painful mass developed along the track of the stab-wound. This mass, which proved to be bone, was later removed. It was attached to the femur by a broad base. These few cases would seem to indicate that ossifying myositis develops but very rarely after incised wounds.

Three cases are reported in which bone has developed in laparotomy wounds. Two of these were observed by Röpke, and one by Rubesch. I would like to review one of the cases reported by Röpke.

The patient, forty years of age, was operated on for perforation of a duodenal ulcer ten hours after perforation. An incision was made through the right rectus muscle above the navel. The perforation was closed, covered with omentum, and a gastroenterostomy performed. The abdominal incision was closed with catgut, silk being used for the skin suture. Repair occurred without suppuration. Five weeks afterward an obstruction developed suddenly, and a second operation was performed, an anastomosis being made between the proximal and distal loops of the bowel used in making the gastro-enterostomy. The abdomen was opened through the old scar at the level of the navel. A piece of bone measuring 2 cm. in length and 1 cm. in width was found in the right rectus muscle.

While the case under consideration has not been operated on, and the new tissue which has formed has not been examined, I do not believe that there is any doubt as to its character. Nothing definite is known concerning the factors which cause the formation of bone in clean incised wounds. The muscle-fibers were not lacerated in this case because no tension was placed upon the incised tissues. Retractors were not used. The incision passed through the lineæ transversæ, and this suggests that osteoblasts may have remained dormant in those lines which represent the extension forward of the ribs, and that these may have proliferated to form this new bone.

I shall not remove the bone. The tenderness in the scar is subsiding and the chances for absorption of this newly formed tissue are good. In some instances the ossifying process reaches its full development rapidly, and the bone which is formed undergoes little or no change, while in other cases the process develops fairly rapidly, and then absorption of the bone begins, so that eventually no or but few traces of the newly formed bone can be found after *x*-ray examination.

As there has already been considerable improvement as regards tenderness and local discomfort no attempt will be made to remove the bone. It will cause little or no discomfort or inconvenience even if absorption does not occur.

BLASTOMYCOSIS AND SPOROTRICHOSIS

Summary: Clinical history, diagnosis, and treatment of blastomycosis and sporotrichosis as illustrated by 3 cases; discussion of a case of generalized blastomycosis by Dr. A. H. Montgomery.

THE type of skin lesion which I am about to present is usually seen by the dermatologist. Occasionally, however, the surgeon is called upon to make the diagnosis, and in some instances surgical measures must be resorted to because the lesion has resisted other lines of treatment and has spread. I shall ask Dr. Montgomery to discuss the subject of generalized blastomycosis, and to give the facts regarding a case which he has had under observation for some time, and shall show you the photographs and give you the history of a case of sporotrichosis which was in the clinic a short while ago. I shall present the photographs of this case to show how it differs from blastomycosis, with which it is sometimes confused.

This patient, Mr. A. S., fifty years of age, has had a lesion about the left elbow for a number of years. He gives the following history: In August, 1898, an abscess appeared above the left elbow. This was incised and did not heal. Four months later the diseased tissue was excised. The lesion soon recurred, and it was cureted from time to time until 1905. At this time the Finsen light treatment was employed, without any noticeable improvement. In 1906 large doses of potassium iodid were employed and the *x*-ray was used. The lesions which existed were practically healed by this line of treatment. The skin at the site of the former lesion was slightly tender, but the ulcer healed. In 1915 the lesion appeared again, but healed after ten salvarsan treatments. It remained healed during the winter, but then appeared again. Salvarsan could not be obtained at this time and the *x*-ray was again used. At first the disease seemed to be controlled by this treatment, but later it began to progress.

Recently the patient has had eight injections of salvarsan, but the lesion has progressed.

The skin lesion is characteristic clinically of blastomycosis (Fig. 424). The histologic appearance of tissue which has been examined leaves no doubt as to its nature, and the organism has been recovered from it. Surgery is to be resorted to because the lesion has not been controlled by the means ordinarily employed, and because the *x*-ray examination would seem to indicate that the head of the radius is involved.

I shall make a wide excision of the lesion, carrying the incision far into healthy skin.

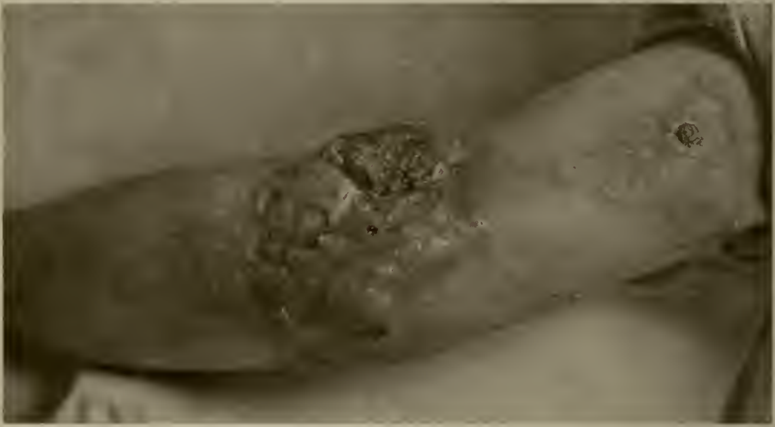

Fig. 424.—Blastomycotic lesion over the outer surface of the elbow and on the posterior surface of arm. Described under Case I.

The head of the radius is exposed beneath the lesion, and the bone seems to be involved only superficially and directly beneath the lesion. Only the portion of the head of the radius which is involved will be removed.

In covering this large defect I shall use a pedunculated flap containing subcutaneous tissue, taken from the posterior surface of the forearm, to cover the head of the radius, which has been exposed, and the posterior surface of the elbow, so as to interfere as little as possible with motion. The remainder of the defect will be covered later by epidermal grafts. It is best to delay this step until we can determine whether or not the disease has been removed, so as to avoid any possibility of infecting the thigh, if it is deemed necessary to take the grafts to cover this defect (Fig. 425).

I shall now ask Dr. Montgomery to give you the history of a case of generalized blastomycosis which he has had under observation for some time. This case has lived longer than any case of generalized blastomycosis of which I have knowledge, with the exception of one, which I believe has completely recovered.

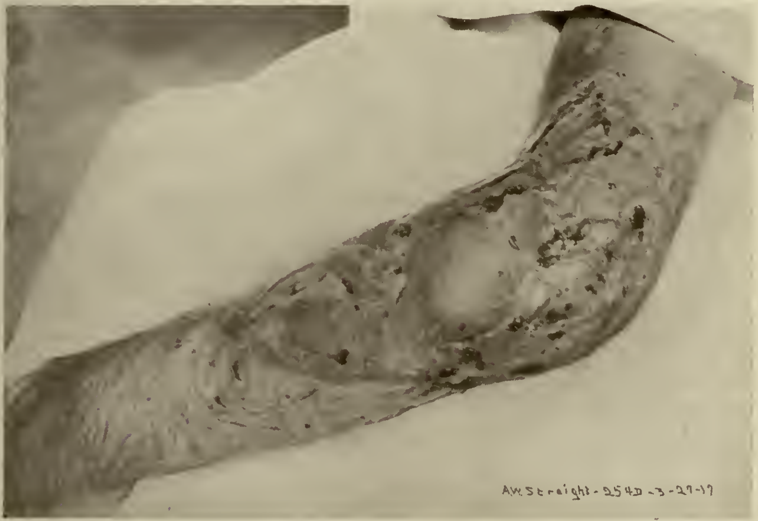

Fig. 425.—Appearance of defect after the skin lesion has been excised. A pedunculated flap has been turned from the forearm to cover the head of the radius. The remaining parts of the defect have been covered by epidermal grafts. This picture was taken some four weeks after the operation.

DR. A. H. MONTGOMERY'S DISCUSSION OF A CASE OF GENERALIZED BLASTOMYCOSIS

The patient to whom I refer, Mr. A. S., forty-one years of age, was admitted to this clinic the 22d of February, 1915. He was a tinsmith by trade, but for some time he had worked as a janitor in a seed store. He has had nasal catarrh since childhood, denies venereal disease, and does not use tobacco or alcohol. One child is living and well.

The present trouble began the middle of November, 1914, when the patient was taken sick with a cough and the general symptoms of an acute cold. The symptoms persisted in spite of treatment, and the patient commenced to raise considerable sputum, especially in the morning. There was little change in the symptoms until about January 1, 1915, when the patient coughed up a tablespoonful of bright red blood. Malaise and weakness increased. Night-sweats developed, and the patient became so miserable that he had to stop work. At this time the calf of the left leg became swollen and painful, and a peculiar dry crusted ulcer appeared over the left shoulder-blade and over the right hip and left buttock. Hot applications were placed upon the swollen and painful calf, but the condition gradually became worse. On February 28, 1915, the swelling was incised, and about 2 tablespoonfuls of thick bloody pus was evacuated. The leg improved for a few days, but then began to swell again

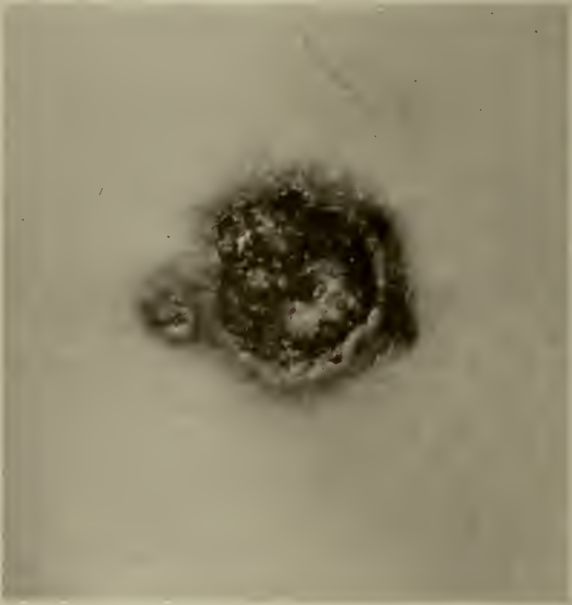

Fig. 426.—Appearance of skin lesion over right trochanter in case of generalized blastomycosis.

and became painful. A tender swelling also appeared on the right forearm just above the wrist. The patient was then sent to the hospital.

An examination made February 22, 1915, revealed a poorly nourished middle-aged man, with loose skin and poor muscular development. On the scalp over the left frontal eminence is a slightly elevated flat lesion measuring 1 x 1.5 cm., with a rather warty, light yellowish surface, with somewhat reddened borders.

Lesions with similar characteristics measuring 5 cm. in diameter are found over the lower third of the left scapula, over the region of the right trochanter (Fig. 426), over the left buttock, and just above the inner end of the right gluteal fold. A fluctuating mass the size of a hazelnut is found over the right occipital region. At the inner extremity of the right eyebrow is a hard, circumscribed, slightly reddened mass, the size of a bean. An indurated mass the size of a man's fist is found in the muscles of the right calf. The incision made February 8th, measuring 1 cm. in length, has not healed. Dark, hemorrhagic pus is oozing from the opening. A fluctuating mass about 3 cm. in diameter is found just above the lower end of the right ulna. The nails are hyperkeratotic. Examination otherwise negative. Temperature 100.2; F., pulse 108, respirations 32.

Urine, negative.

Blood examination: Hemoglobin, 90 per cent.; W. B. C., 16,400; Wassermann, negative.

Two days after admission to the hospital the abscess in the calf of the left leg was opened, and a cupful of thick bloody pus removed. During the next four weeks abscesses appeared in the calf of the right leg, on the lower part of the right forearm, and just above the upper border of the right patella. The cavities were packed with iodoform gauze after incision, and all healed rapidly. The skin lesion over the right trochanter was excised, the wound healing by primary union.

Numerous blastomycetes were found in the pus removed from the different abscesses (Fig. 427).

Blood-cultures were negative.

Stained sections of tissue removed from the skin lesions and abscess cavities revealed foci of central necrosis surrounded by areas of round-cell infiltration, containing many giant cells and some polymorphonuclear leukocytes.

x-Ray examination of the chest revealed a generalized fibrosis of both lungs, a picture very similar to that associated with an extensive tuberculosis of the lungs. A small calcified nodule is found in the left lung.

Repeated examination of the sputum failed to reveal either tubercle bacilli or blastomycetes.

The patient was placed upon increasing doses of potassium iodid and advised to see that the hygienic conditions surrounding him were of the best. The temperature, with evening elevations up to 101° F., decreased to 99° F., and his general condition began to improve under this treatment. The skin lesions continued to spread slowly in spite of improvement in the general condition. The patient left the hospital May 7, 1915. On May 18, 1915, he reported to the clinic. The abscesses were about healed and the skin lesions were somewhat improved at this time. During the

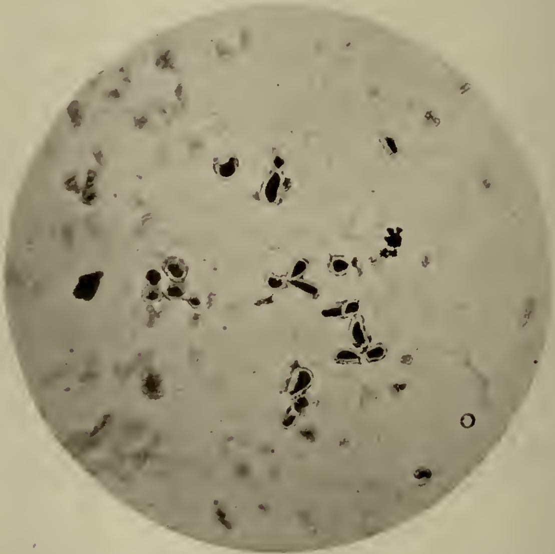

Fig. 427.—Blastomycetes in pus. High power. Note doubly refractive membrane about organisms.

past five weeks he has gained 11 pounds and the cough is much better. The dose of potassium iodid has reached 200 grains a day.

The treatment was continued until November, 1915, when the patient, of his own accord, discontinued the potassium iodid for several weeks. During this time another abscess developed at the site of the one in the left leg which had been previously drained. The abscess promptly healed after drainage and resumption of the potassium iodid.

In the spring of 1916 he moved to New York State, where he has been working on a farm up to the present time.

The amount of potassium iodid has been gradually increased up to as high as 700 grains a day. He has continued to take this amount quite regularly. For short periods it has been necessary to reduce this amount one-half because of the symptoms of iodism. He has gained 20 pounds in weight since leaving the hospital and feels well and strong. All the lesions have healed, with the exception of one on the face, which seems to be increasing some in size.

I have recently reviewed the 44 cases of generalized blastomycosis which I could find reports of. In these 44 cases the abscesses were distributed as follows:

	Cases.
Lungs	42
Pleura	7
Larynx	2
Trachea and bronchi	1
Thyroid cartilage	1
Retropharyngeal and subpleural	2
Myocardium	2
Brain	8
Spinal cord	3
Dura	5
Spleen	18
Liver	11
Kidney	12
Adrenal	2
Pancreas	4
Prostate	5
Psoas and other deep abscesses	5
Pericardium	2
Peritoneum	1

	Cases.
Skin	3
Bones exclusive of the vertebræ	16
Vertebræ	9
Joints	9
Lymph-nodes	9
Muscles and soft parts	4
Epididymis	2
Testicle	1

Of the greatest surgical importance are the abscesses developing deep in the muscles and the bone and joint lesions. In the generalized cases, as just mentioned, bone lesions were noted in 56.8 per cent. and joint lesions in 20.4 per cent. Definite sequestra were observed in 2 cases, but in the rest the process consisted of caries. In 20.4 per cent. the vertebræ were affected, the process resembling closely that found in tuberculosis.

The following table indicates the frequency with which the different bones and joints have been affected in the generalized cases:

Bones.		Joints.	
Tibia	10	Elbow	5
Radius	1	Knee	8
Ulna	3	Ankle	3
Ribs	9	Wrist	3
Skull	6	Shoulder	1
Vertebræ	9	Hip	1
Carpal bones	2	Sternoclavicular	1
Metacarpal	2		
Tarsal	2		
Metatarsal	5		
Sternum	3		
Patella	2		
Femur	3		
Fibula	2		
Ilium	2		
Sacrum	1		
Humerus	1		

Of the viscera, the lungs (42 times) and pleura (7 times) are most frequently involved. Empyema was noted in 1 case. The spleen was involved in 18 cases, the liver in 11, and the kidneys in 2. The prostate was involved in 5 cases. Lesions were found in different parts of the brain by LeCount in 8 cases. Meningitis was observed three times.

It is interesting to note in this instance that the disease apparently began with an acute infection of the respiratory tract. The patient worked in a seed store, where he undoubtedly breathed much vegetable dust. The relation of this work to the disease is somewhat problematic, owing to the considerable period elapsing between the time when he gave up this work and the appearance of the disease.

The diagnosis in this case could be made with ease by the character of the pus evacuated from the abscesses in the calf and of the skin lesions. It is of unusual interest because of the length of the clinical course of what is apparently a generalized case of blastomycosis with definite improvement of the general condition and local lesions. I know of but one case of undoubted generalized blastomycosis that has recovered. The disease in the present case has lasted over two years and eight months, with continued improvement. It is possible that the disease may progress at any time and prove fatal, but at the present time the indications are that the patient will continue to improve.

Dr. Lewis: While these cases are being discussed I would like to show the photographs of another lesion which may come to the surgeon for diagnosis and treatment, which is frequently mistaken for blastomycosis. This lesion does not resemble that of blastomycosis at all. It is so typical in its clinical manifestations that the diagnosis should be made without any difficulty.

These photographs were made from a boy twelve years of age who came to the clinic in August, 1915. His home was in Morris, Illinois. He gave the following history: One day while playing in a pasture he was chased by a steer. In getting out of the pasture he scratched his left foot at the instep on a barbed wire. The pasture was used as the temporary quarters of cattle and horses shipped in from neighboring states. These usually were shipped from Kansas City. The last consignment of cattle had come from Iowa, near the Mississippi River.

The scratch healed and no attention was paid to it until several days later, when an infection developed at the site of the scar and began to extend in the tissues adjacent to it. This inflammatory process was not acute or painful and was but slightly tender. Three weeks later nodules appeared along the lymphatics of the leg and thigh. Local treatment was instituted, but the lesions did not improve.

Six weeks after the beginning of the infection the patient came to the clinic. A cyanotic, indurated, ulcerated area as large as a dollar, involving the skin and subcutaneous tissues, was found above the left instep. This area was not painful or tender. The base of the ulcer was flat and red and covered with yellowish-gray pus. The edges of the ulcer were deep, ragged, and under-

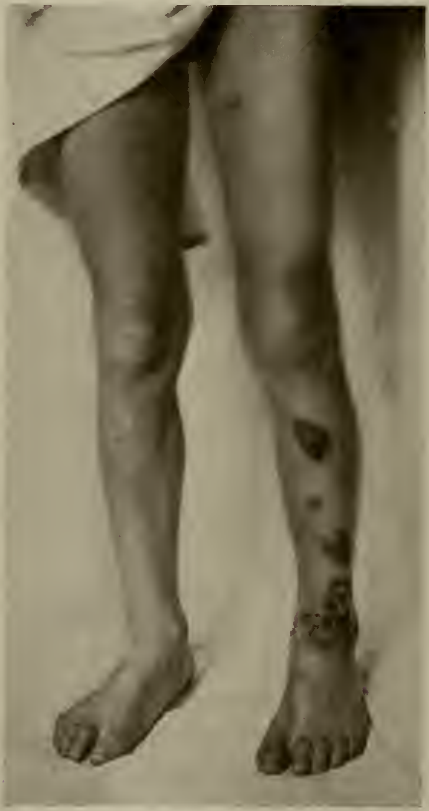

Fig. 428.—Appearance of skin lesions and nodules along course of lymphatics in case of sporotrichosis.

mined. At least twelve abscesses the size of a pea were found in the indurated tissues about the ulcer. Some of these communicated with the floor of the ulcer by sinuses. On the anterior and outer aspect of the leg were four nodules, which had softened. Two more were noted in the thigh. The centers of all these indurated areas had softened (Fig. 428).

The indurated areas are along the course of lymphatics, and we are evidently dealing with a lymphangitis which has ended in nodule formation with subsequent softening.

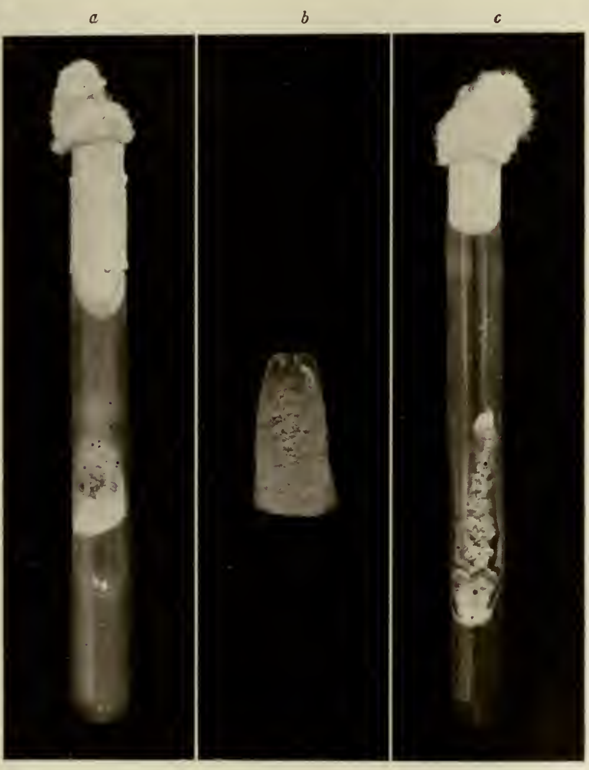

Fig. 429.—Sporothrix in cultures: *a*, Dextrose agar, growth twenty-four days old; *b*, subculture on potato—amount of growth after five days; *c*, subculture on beerwort—appearance five days after transfer.

There is no doubt as to the diagnosis in this case. The scratch caused by a barbed wire is followed by a slow infection, leading to ulceration of the skin about the instep, with subsequent lymphangitis resulting in nodule formation and softening.

This is a typical history of sporotrichosis, and I know of no disease which is more typical clinically, both as regards the history and character of the lesions. I am indebted to Dr. Barney Sharp for the isolation of the organism from the primary focus and the peculiar mucoid pus, quite characteristic of the disease, which was evacuated from the nodules on the leg (Figs. 430, 431).

In 1912 Dr. Walter Hamburger published in the Journal of the American Medical Association a case of this disease observed in Dr. Bevan's clinic. At that time he found in American literature 28 cases, including the one reported by him, of undoubted sporotrichosis, proved by positive cultures of the organism, which were reported during the thirteen years following Schenck's original publication. In addition, he collected 30 cases of highly probable sporotrichosis, cases clinically identical with the 28 positive cases, but without positive cultures.

The geographic distribution of these cases was very interesting: 22 cases occurred in North Dakota, 13 in Kansas, 5 in Nebraska, 2 in Illinois, 3 in Missouri, 2 in New York, 2 in Minnesota, 1 in California, 1 in Iowa, 1 in Indiana, 1 in New Jersey, 3 in South Dakota, 1 in Montana, and 1 in Wisconsin.

The following clinical varieties of the disease have been given by Beurmann:

A. Localized sporotrichosis with sporotrichotic chancre and ascending lymphangitis, ending in nodule formation and softening and local lymphadenitis. The case under discussion is a typical example of this variety.

B. Disseminated gummatous sporotrichosis; multiple subcutaneous nodules distributed without systematic arrangement throughout the body. Small hard, painless, round masses develop early. Later, large and small soft cold abscesses form, no ulceration.

C. Disseminated ulcerative sporotrichosis. Multiple lesions which may resemble those of tuberculosis or syphilis develop. Ecthymatous, rupial, or furuncular lesions may also occur, or there may be a combination of these.

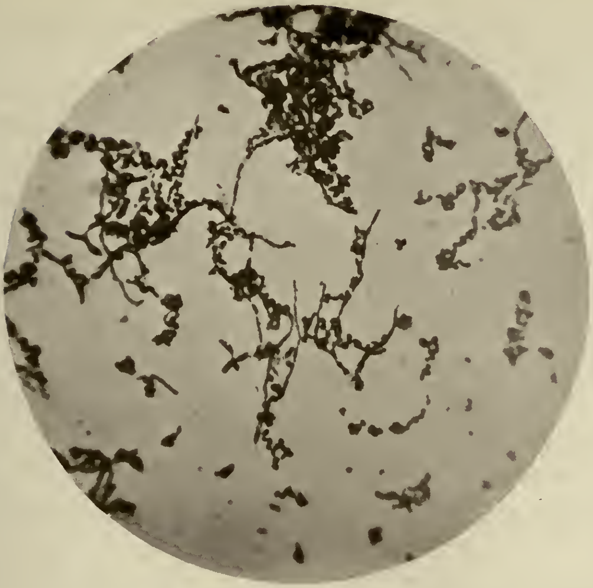

Fig. 430.—Sporothrix: Smear from culture on potato Oil immersion.

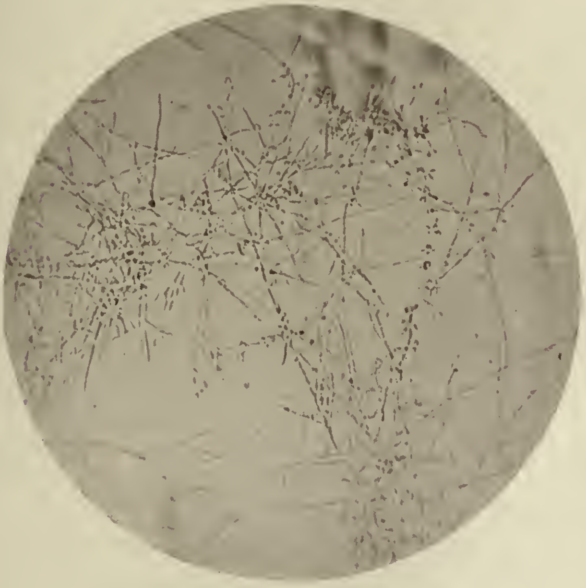

Fig. 431.—Sporothrix: Hanging-drop from broth culture. Oil immersion.

D. Extracutaneous sporotrichosis with localization in mucous membrane, muscles, bones, joints, eye, synovial membrane, kidney, or lungs.

The case under consideration is typical both in history and clinical manifestations of the first class.

The disease responds readily to treatment. In this case a piece of tissue was removed from the ulcer over the instep for histologic examination, and one of the softened nodules along the course of the lymphatics in the thigh was opened so that a bacteriologic examination could be made. The boy was placed upon 15 grains of potassium iodid a day and a weak iodin dressing was applied locally. Within a short while distinct improvement was noted in the lesions, and at the end of four weeks they had practically disappeared.

CLINIC OF DR. HERMAN L. KRETSCHMER

PRESBYTERIAN HOSPITAL

TUBERCULOSIS OF THE KIDNEY—PRESENTATION OF 3 CASES

Summary: Types of renal tuberculosis; renal tuberculosis always secondary to tuberculosis elsewhere in the body; early renal tuberculosis always unilateral; routes of infection—hematogenous most common—tuberculosis of bladder usually secondary to renal tuberculosis; symptoms of renal tuberculosis—their relative frequency and diagnostic value; results of cystoscopy; sources of error in estimation of renal function; operative technic—treatment of the ureter; infected perirenal fat a cause of postoperative renal fistulæ; importance of its proper management.

July 26, 1917.

PATHOLOGICALLY we recognize two types of renal tuberculosis:

1. The acute or subacute miliary tuberculosis.
2. Chronic renal tuberculosis.

The acute miliary occurs as part and parcel of a general miliary tuberculosis, and as such has a medical but not a surgical interest.

Chronic renal tuberculosis is often the only apparent tuberculous lesion that the patient presents, so that the designation "primary renal tuberculosis" has been used. This, however, is not true, pathologically speaking, because careful study enables one to discover evidences of tuberculosis elsewhere in the body. These evidences, at times, cannot be easily demonstrated clinically, such as a healed focus in the lung or a latent or healed tuberculosis of the mesenteric lymph-glands. Only the most painstaking examination at autopsy in which the entire postmortem would fail to show the presence of tuberculosis elsewhere would justify one in differentiating primary renal tuberculosis. In the cases in which there is associated evidence of tuberculosis of the bones and joints and cervical lymph-nodes there is no difficulty in demonstrating a primary focus. In the cases dying of renal tuberculosis in which a careful autopsy is carried out, we are generally rewarded by finding an old healed lesion in some other part of the body. This part is generally glandular, although one may not be able to demonstrate such a focus clinically. It is a good clinical rule to consider renal tuberculosis, although primary in the genito-urinary tract, as being secondary in the body.

Renal tuberculosis is essentially a disease of adult life, most of the cases occurring between the ages of thirty and fifty. Although the largest percentage of cases occur between these ages, cases occur in people under thirty years of age very frequently, and cases of tuberculosis of the kidney in patients over fifty are not at all uncommon. The oldest patient I have seen was a woman of sixty-three; the youngest, a girl of six.

The question of incidence of sex in the occurrence of renal tuberculosis is an interesting one, and one that is by no means settled. The occurrence of renal tuberculosis and the reporting of cases depend upon several factors. First, upon the practice of the individual operator. In the practice of one who sees more men patients than women, as many urologic surgeons do, the occurrence would be in favor of the males, while the opposite would be true in the statistics of the surgeon whose practice is of a gynecologic trend. Speaking from my own experience, I may say that in my last 77 consecutive cases of renal tuberculosis there were 40 females and 37 males.

It has been said that the diagnosis is made oftener and much earlier in women than in men, hence more women are operated upon than men. In men the diagnosis is often made relatively late, so that more men than women are beyond surgical relief when the case is diagnosed, and, therefore, while more women are operated upon, more men are refused operation.

Side Affected.—That early renal tuberculosis is a unilateral disease there is no doubt. This fact has been proved time and again in large series of cases in which great care has been exercised in studying the so-called healthy kidney. Patients operated upon in whom this point has been determined and in whom the after course has been observed have proved this question. These clinical facts are at variance, however, with the autopsy reports, according to which renal tuberculosis is a bilateral disease. This is true at the autopsy table, and when these statements are made one must not forget that these are the findings in patients who died, and who were not subjected to early treatment. Statistics as to whether the remaining kidney subsequently became tuberculous are not at hand. I think, however, that one is justified in stating that renal tuberculosis is a unilateral disease in the great majority of cases, and if the infected kidney is subjected to early surgical interference the opposite kidney remains free from disease.

The statement is frequently made that renal tuberculosis occurs more frequently on the right side because the right kidney is more movable than the left. Statistics prove that the right kidney is more often the seat of tuberculosis than the left, but the percentage is so small as not to have very much significance. In Küster's statistics there were 189 cases of right-sided tuberculosis as compared to 163 cases of left-sided tuberculosis. These figures, I think, are about the average.

Routes of Infection.—I. *Hematogenous.*—Clinical interest has always been directed to the routes of invasion. How do the tubercle bacilli get to the kidney? At the present time it is conceded that in the largest number of cases the tubercle bacilli reach the kidney by the blood-stream. This conclusion is based upon facts gleaned from three sources: First, clinical observation; second, autopsy findings; third, animal experiments. One is now in a position to determine by means of cystoscopy and ureteral catheterization whether or not the kidney is the only part of the urinary tract to be the seat of tuberculosis. In cases in which there is an involvement of the bladder one is often able to state that the kidney was diseased before the bladder, because in the former we find evidences of far-advanced tuberculosis, whereas the bladder lesions are either recent or they may be localized to the neighborhood of the corresponding ureteral orifice. In the cases that come under observation early in the course of the disease there may be no bladder involvement at all. These clinical facts have also been proved at autopsy in cases of unilateral renal tuberculosis. Occasionally one may observe cases of renal tuberculosis without involvement of the bladder in patients who refuse to have any surgical treatment. These patients are often treated in various inefficient ways. Later, when they again present themselves for examination, cystoscopic examination will show that there is now evidence of tuberculosis localized around the corresponding ureteral orifice. Further clinical proof that genito-urinary tuberculosis is primarily renal may be adduced in early cases before severe bladder changes have taken place in the following way: If these patients are subjected to routine cystoscopic examination after the diseased kidney has been removed, it is not uncommon to see the bladder changes completely disappear, so that the bladder mucosa appears normal.

Although animal experimentation has not been very extensive, there are noteworthy reports at hand, particularly the work of Pels Leusden, who was able to produce renal tuberculosis in animals by intravenous injection of tubercle bacilli that closely resembled human renal tuberculosis.

II. *By Direct Extension.*—Renal tuberculosis that owes its origin to direct extension from a neighboring tuberculous process, such as tuberculosis of the spine, suppurating glands, a tuberculous empyema, are medical curiosities, and the cases reported are practically all in the older literature.

III. *By Extension Up the Ureter.*—Owing to the fact that tuberculosis of the kidney may be present for a long time without producing symptoms, and because of the fact that the first symptoms are often bladder symptoms, the older urinary surgeons taught that the primary lesion was vesical and the secondary lesion was renal, which lesion was due to the direct extension of the process up the ureter. The error of this teaching was corrected with the advent of the cystoscope and the more careful study of the bladder which it permitted, so that today many men question and others firmly deny the existence of primary bladder tuberculosis.

Should the bladder be infected by tuberculosis secondary to tuberculosis of the prostate or seminal vesicles, the possibility of the kidney becoming infected through the lumen of the ureter exists, inasmuch as I have shown that the ureteral orifice may not always prevent regurgitation of the fluid from the bladder up into the kidney pelvis; and that the fluid may be transported from the pelvis to the kidney parenchyma has been proved by cases in which the kidneys were removed after pyelography, which showed the silver salt (collargol) as far as the tubules, and in some cases in the glomeruli. In these cases (collargol), however, as a rule a good deal of pressure was used, a fact that would hardly come under consideration here. Experimentally it has been proved by Bauereisen that there is a lymphatic connection between the bladder and kidney by the lymphatics of the ureter. This offers a theoretic route by which tubercle bacilli might reach the kidney from the bladder.

IV. *Lymphogenous.*—In this connection one may briefly discuss the observations of Tendeloo and Bongersma, who have advanced the idea that tuberculosis of the kidney may be lymphogenous in origin, basing their theory on a case that came to autopsy in which Tendeloo found cheesy para-aortic lymph-glands on the same side on which he found a very advanced tuberculosis of the kidney; on the same side he also found adhesions between the diaphragm and the lung, the regional lymph-glands of which showed tuberculosis. Because of the presence of these tuberculous lesions, all being on one side of the body, he believed that the route of infection was lymphogenous and was something about as follows: "The bacilli were carried from the lung and bronchial lymph-glands through the pleura and diaphragm to the para-aortic glands, and from there into the kidney."

That the tubercle bacilli may be transported retrograde from the bronchial to the aortic glands he believes, and to substantiate his views he calls attention to occasional finding of pigment in the aortic glands. His views have not been universally accepted. As a matter of fact, they have found very few adherents. Doubtless this is due to the fact that the evidence, clinical and otherwise, is overwhelmingly against them, and that they are based on but a limited number of observations. As arguments against the lymphogenous route of infection, one may mention:

1. In the largest percentage of cases there is an absence of adhesions between the pleura and diaphragm—one of the conditions which Tendeloo lays much stress upon in order to render possible a retrograde transport of bacilli.

2. Autopsy statistics from many cases of renal tuberculosis fail to show that the retroperitoneal glands present evidences of tuberculosis.

3. Cases have been reported in which adhesions are found on the side opposite to the diseased kidney. It has furthermore been suggested that although all the pathology was found on one side of the body in Tendeloo's case, the sequence of events may not have been just in the order that he assumed.

SYMPTOMS

For the purpose of convenience these may be divided or considered under the following headings:

1. Kidney symptoms.
2. Bladder symptoms.
3. Symptoms due to changes in the urine.

Kidney Symptoms.—As a rule kidney symptoms do not play an important rôle in the clinical history. Renal palpation may or may not be of value as an aid in diagnosis. Often even in well-advanced cases palpation may be entirely negative, so that while the kidney after removal may prove to be very materially increased in size, yet clinically it would be impossible to detect enlargement by palpation. Again, in other cases the kidney may be palpable, especially in that group of cases in which its normal mobility has not been lost. This occurs in cases in which the disease has remained confined within the renal capsule.

Tenderness to Pressure.—This may be variable. It may be demonstrated by ordinary palpation or by deep pressure with the thumb placed in the angle made by the last rib and the deep lumbar muscles. Should these fail to elicit tenderness, I often resort to fist percussion, which I first saw Zuckerkandl use in his clinic in 1906.

Great care must be used in evaluating these two symptoms, and we should bear in mind the possibility of both of these symptoms being elicited on the side of the normal kidney, hence leading to an erroneous conclusion. Both of these symptoms may be due to an enlargement or compensatory hypertrophy of the normal kidney. I know of at least one instance in which the presence of an enlargement and tenderness were attributed to a tuberculous kidney, and it was decided to remove this enlarged and tender kidney. Cystoscopic examination made just before the operation demonstrated the enlarged and tender kidney to be the normal one. The tuberculous kidney was small and contracted and hence escaped detection upon physical examination. In one of the cases to be operated on this morning this phenomenon is present, namely, the patient has pain and tenderness on the right side, whereas the tuberculosis has been proved to be on the opposite side.

Colic.—Renal colic associated with or as a symptom of renal tuberculosis is sometimes due to the presence of calculi. In the largest percentage of cases there are really incrustations of necrotic tissue in the tuberculous cavities. In other instances one may find incrustations of tuberculous ulcerations in the pelvis. Furthermore, in other cases true calculi consisting of phosphates and carbonates may be found. In rarer instances oxalate and uric acid stones are found associated with tuberculosis of the kidney. Doubtless in many cases such calculi are merely coincidents with the tuberculosis. In one of the cases that we will demonstrate this morning such a coincidence of lesions exists. The only other instance in which I have seen this diagnosis made and verified by operation appeared when I was working in Zuckerkandl's clinic in the Rothschild Hospital in Vienna. Whether or not in our case we are dealing with a primary or secondary stone, and the true composition of the stone, will be determined after the kidney has been removed.

Bladder Symptoms.—*Frequency of Urination.*—In the majority of cases one can elicit a history of frequency of urination. In some patients the frequency of urination is the first symptom that the patient observes, that is, it is the first symptom to at-tract the patient's attention to the fact that something is wrong. One of the characteristics of frequency associated with renal tuberculosis is its nocturnal occurrence. This may necessitate arising once or twice each night, or the patient may be disturbed as often as every fifteen to thirty minutes. As a rule, the nocturnal frequency is gradual in onset and progressive. At times frequency may be so marked during the day that the patients become true invalids, being unable to perform their social duties or attend to business. Frequency is oftentimes associated with great urgency, so that the patients are obliged to respond at once, and if they are not in a position to respond they are unable to control the act, so that the urine escapes and soils their linen. This incontinence is one of the earliest symptoms and may be present both day and night. Naturally this symptom would be more aggravated at night when the patient is asleep. At times one may also see this symptom present in patients who do not have any special frequency of urination, and it has also been noted in patients who have had no bladder involvement, but this is the exception and not the rule. As a rule, the incontinence occurs in late cases in which there is more or less extensive involvement of the bladder with ulceration of the mucous membrane.

Pain.—As a result of the tuberculous involvement of the bladder the bladder mucosa becomes sensitive so that the act of micturition is painful. The pain may be localized to the bladder, but more often it radiates along the urethra. The pain may or may not be relieved by the act of urination and at other times the relief is of very short duration. The bladder is sensitive even to the introduction of warm bland fluid, such as water or normal salt, so that distention by these bland fluids for cystoscopic examination produces a great deal of pain. The pain is also much aggravated by irrigations with silver nitrate. Many patients volunteer the information that silver nitrate irrigations always make them worse, so that this form of treatment finally becomes intolerable.

Suprapubic Tenderness.—Associated with bladder pain many patients are exquisitely tender, so that women, for example, are unable to wear their corsets, the pressure of the corsets producing a great deal of bladder pain. To the examining hand these patients are very sensitive, so that one cannot make much pressure over the pubes. Indeed, because of this sensitiveness, examination of the pelvis causes very much pain, and satisfactory pelvic examination in some of these women is impossible without resorting to the use of an anesthetic.

Cystoscopic Findings.—For a good many years it was taught that tuberculous cystitis had a definite cystoscopic picture, by which it was always possible to recognize it. This we now know is not the case, many cases presenting a cystoscopic picture no different from that of any other cystitis. The mucosa is reddened and loses its gloss, the blood-vessel markings disappear, and the mucous membrane becomes swollen and edematous. Often there may be seen fibropurulent shreds adhering to the mucous membrane, and here and there one sees a small ulceration. These ulcerations now and then show the presence of small tubercles at the periphery. Tubercle formations in the bladder have a predilection as regards their location, being found around the ureteral orifice on the side of the affected kidney and often on the anterior wall of the bladder. Exceptions to these areas of localization, however, may be found. Indeed, it may be possible to find tubercles along the ureteral orifice of the opposite or well kidney. Such a cystoscopic picture we saw recently in one of our cases in which the diagnosis that would have been made if we had confined ourselves to the cystoscopic findings alone would have been incorrect and might have led to the removal of the wrong kidney.

Changes in the Urine.—1. *Demonstration of Tubercle Bacilli.* —This is by all odds the most important symptom of renal tuberculosis, and it is the one finding that clinches the diagnosis. It is the one positive finding, and, therefore, it gives one a feeling of extreme satisfaction to be able to demonstrate tubercle bacilli in a specimen obtained per ureteral catheter from the kidney. The demonstration of the organisms I believe can be made oftener than we generally suppose. Many men have the impression that the demonstration of tubercle bacilli in the urine is a task bordering on the impossible. I believe that the organisms can be demonstrated in the urine in upward of 90 per cent. of the cases.

2. *Pyuria.*—Perhaps more constantly present and more easily demonstrable than the presence of the tubercle bacillus is the presence of pus in the urine. The amount of pus may vary from one examination to another, so that the specimen examined today may show a great deal of pus and a second specimen examined tomorrow may be relatively free from pus. I recall one such instance in which at examination we were unable to demonstrate the presence of pus cells in the urine, and yet at operation a very advanced tuberculous kidney was removed.

3. *Hematuria.*—This is not always present, especially early in the disease, although tuberculosis is one of the three most frequent causes of hematuria, the other two being stone and tumor. Out of a series of 238 consecutive cases of hematuria that were reported in the Journal of the American Medical Association, February 24, 1917, 33 were due to tuberculosis of the genito-urinary tract, so that of all the things that produce hemorrhage in the urinary tract one should think of tuberculosis as the first. The amount of blood is variable—it may be microscopic or, again, may be so great as to overshadow and obscure all the other symptoms of renal tuberculosis. The hematuria may be so profuse and continuous that the life of the patient is endangered, calling for a nephrectomy. After the kidney has been removed knowledge of the fact that the hemorrhage was due to tuberculosis is first obtained. Terminal hematuria with the passage of small blood-stained shreds of pus is seen more frequently than is the presence of profuse hematuria. This occurs generally at the end of urination and is associated with a great deal of pain.

CASE I

Miss E. G., aged thirty-six.

Present Complaint.—Pain over right side of the upper abdomen and bladder, frequency of urination and burning on urination. The patient's present attack began last March, with irritation of the bladder, frequency of urination, and finally dull pain, seemingly within the bladder on the right side. Previous to this time the patient had three similar attacks. In September, 1915, the patient stated she had the first kidney symptoms, manifested by chills, fever, and enlargement of the right kidney, lasting for three weeks, during which time she was in a hospital. Two similar attacks followed, one in January, and the last one in April, 1916. From April, 1916, to March, 1917, the patient enjoyed good health and was free from kidney or bladder symptoms.

The present attack began insidiously in March, with bladder irritation, frequency of urination, and some burning and incontinence. The patient states that she was compelled to urinate about every hour during the day and from three to seven times during the night. The pain over and within the right side began rather insidiously, seeming to be more of a continuous dull ache. The pain is aggravated by exertion and fatigue. The pain is associated with burning at times, and is confined to the right side so the patient cannot lie on that side. During the last two months the patient has limited the amount of fluid intake for fear of increasing the frequency. The incontinence is generally most marked at night when she is sound asleep. The calls to urination are imperative and she must respond to the desire at once. If she does not do so she is unable to hold the urine and she soils her linen. For this reason she does not go to the movies or travel very far from home.

Previous History.—Four years ago the patient had her appendix removed. The appendectomy, needless to state, did her no good. The symptoms, pain in the side, etc., continued just the same after as well as before the operation. Her general condition is good. Appetite is good. She sleeps fairly well except for the frequency. She has lost about 8 pounds in weight. There is no history of tuberculosis or urinary disease in the family.

Physical Examination.—*Head and Neck.*—Negative. There are no palpable cervical glands and no signs of any previous suppurative disease in the glands. The thyroid is a little full.

Chest.—Asymmetric, due to a slight degree of curvature to the right in the midthoracic region, producing a bulging of the tho-

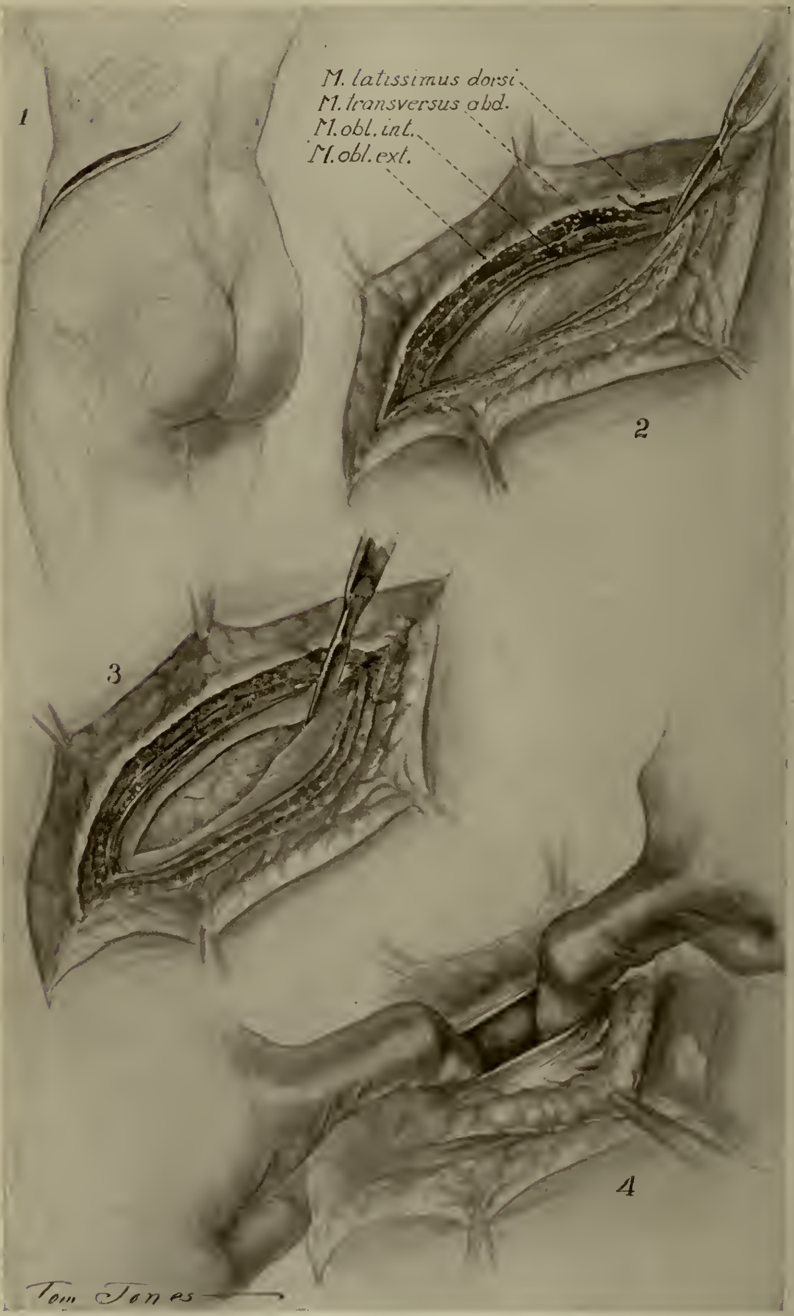
1
M. latissimus dorsi
M. transversus abd.
M. obl. int.
M. obl. ext.
2
3
4
Tom Jones

Fig. 432.

racic cavity on the right posterior side. Slight dulness over the right infraclavicular region. Expiratory sound prolonged over right apex anteriorly and posteriorly. Breath sounds over rest of lung normal.

Abdomen.—Liver and spleen negative. Both kidneys are easily palpable. Right kidney is very sensitive. Tenderness over lower part of abdomen; over bladder she is exquisitely sensitive, so that one cannot make very much pressure over pubes.

Cystoscopic Examination.—Bladder capacity, 3 ounces. In the apex of bladder were seen several ulcerating tubercles. There is a good deal of cystitis in the right half of the bladder, while the left half appears fairly normal. The left ureteral orifice is normal. The right ureter is ulcerated and dilated. The bladder around it is red and swollen.

Ureteral Cathcterization.—Left catheter passes all the way up without difficulty or obstruction. On the right side the catheter passes up only about 6 cm.

Examination of the urine shows the following:

1. Cultures:
    (*a*) Bladder—staphylococci.
    (*b*) Right ureter—sterile.
    (*c*) Left ureter—sterile.
2. Leukocyte counts:
    (*a*) Bladder, 90.
    (*b*) Right ureter, 60.
    (*c*) Left ureter, 20.
3. Examination for tubercle bacilli:
    Urine from right ureter shows tubercle bacilli. No tubercle bacilli in specimen from left ureter.
4. Phenolsulphonephthalein test:
    Time of appearance: left, three minutes; right, eight minutes.
    Output: right, 3 per cent.; left, 44 per cent.

Fig. 432.—Tuberculosis of the kidney: 1, The usual oblique incision used for exposing the kidney; 2, the muscles have been divided and the transversalis fascia exposed; 3, the transversalis fascia is divided with a scalpel; the perirenal fat shows in the lower part of the wound; 4, an incision made in the perirenal fat is enlarged by blunt dissection with the fingers preliminary to delivering the kidney.

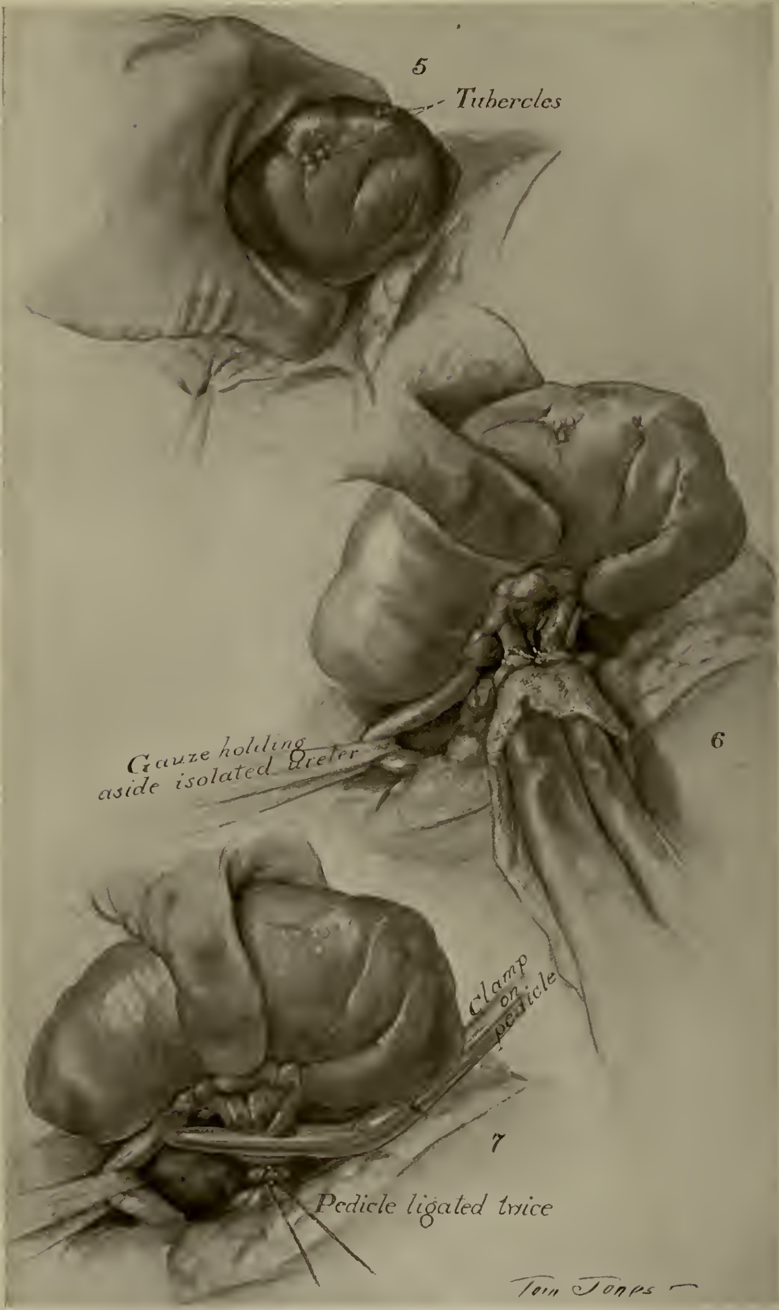
5
Tubercles
6
Gauze holding aside isolated ureter
Clamp on pedicle
7
Pedicle ligated twice
Tom Jones

Fig. 433.

Examination of the blood shows 12,500 leukocytes; 70 per cent. hemoglobin. Blood-pressure is 110 systolic and 60 diastolic.

x-Ray examination shows the presence of calculus in the right kidney.

Summarizing this evidence, we find that both kidneys are palpable, that the right kidney is more tender than the left, and that there is suprapubic tenderness. Cystoscopic examination shows tuberculous changes in the bladder; these changes are localized to the right half of the bladder, particularly around the right ureteral orifice. Ureteral catheterization demonstrates tubercle bacilli in the urine from the right ureter, whereas the urine from the left is clear and free from organisms. The phenolsulphonephthalein test shows the right kidney to be eliminating 3 per cent. and the left 44 per cent.

Our conclusions, therefore, are as follows: This patient is suffering from a double lesion; that is, she has tuberculosis of the right kidney and also a stone in the right kidney. We have demonstrated the left kidney to be free from disease. It has about normal function as shown by the thalein test. We have demonstrated that this kidney is doing most if not all the work. Therefore I think we are justified in proceeding to the removal of this right kidney.

Operation.—I will make the usual oblique kidney incision parallel with the right lower costal margin (Fig. 432, 1). I will make this incision very long and carry it down well forward in order that we may get a good exposure of the ureter and in order to remove as much of it as possible. The muscles are divided and the transversalis fascia opened. The perirenal fat is seen (Fig. 432, 2 and 3). The fatty capsule of the kidney is split and the kidney delivered into the wound (Fig. 432, 4). We will first isolate the ureter and separate it from the surrounding connective tissue and fatty tissue (Fig. 433, 5–7). The ureter is followed downward

Fig. 433.—Tuberculosis of the kidney: 5, Kidney brought into view; a few groups of isolated tubercles are seen on the surface; 6, isolation of the pedicle. The ureter has previously been freed and is retracted by a piece of gauze. The peripelvic fat is removed by blunt dissection with a piece of gauze; 7, after removal of the peripelvic fat the pedicle of the kidney is clamped and doubly ligated proximal to the clamp.

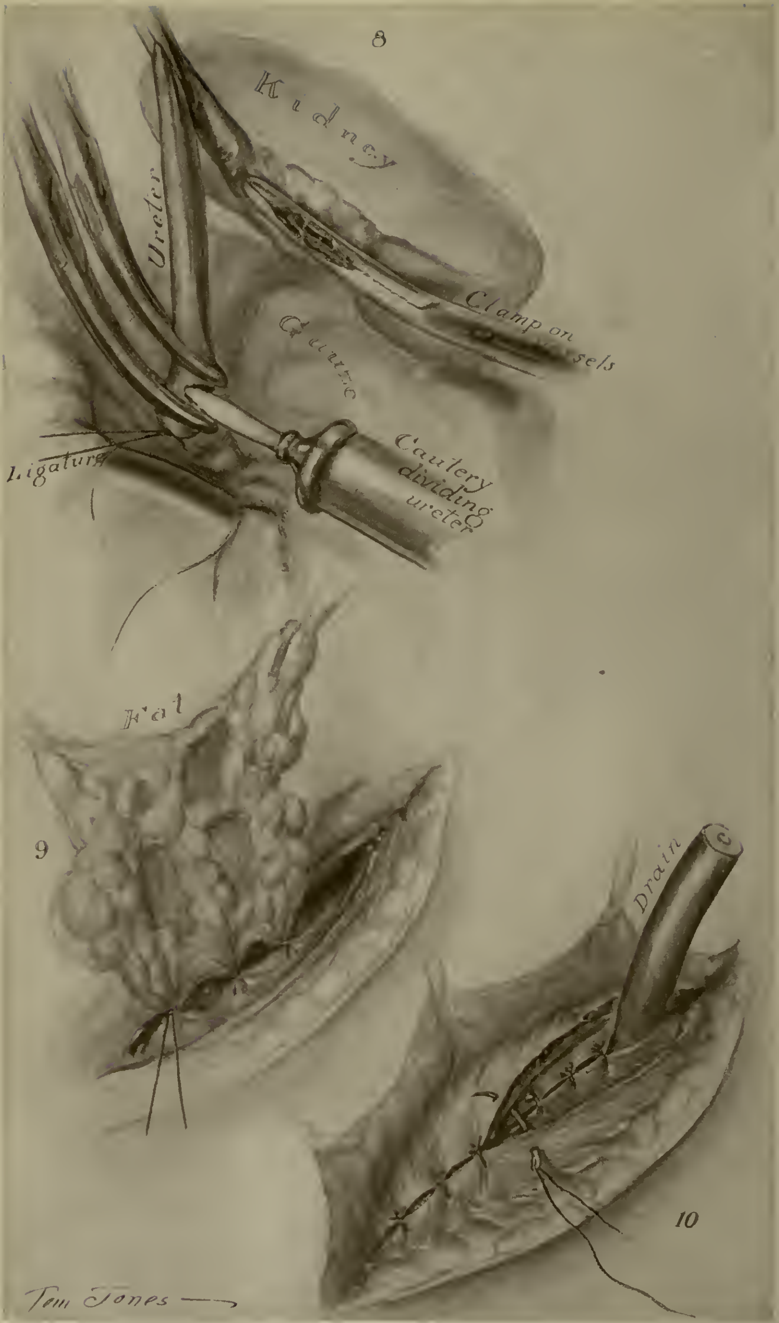
8
Kidney
Ureter
Clamp on
sels
Gauze
Ligature
Cautery dividing ureter
Fat
9
Drain
10
Tom Jones

Fig. 434.

into the pelvis as far as the broad ligament. The ureter is severed with a Paquelin cautery (Fig. 434, 8). The renal vessels are severed after ligating them with three ligatures. The perirenal fat is excised after applying a ligature (Fig. 434, 9). The wound is packed with a small piece of iodoform gauze and the incision is closed by three layers of sutures (Fig. 434, 10).

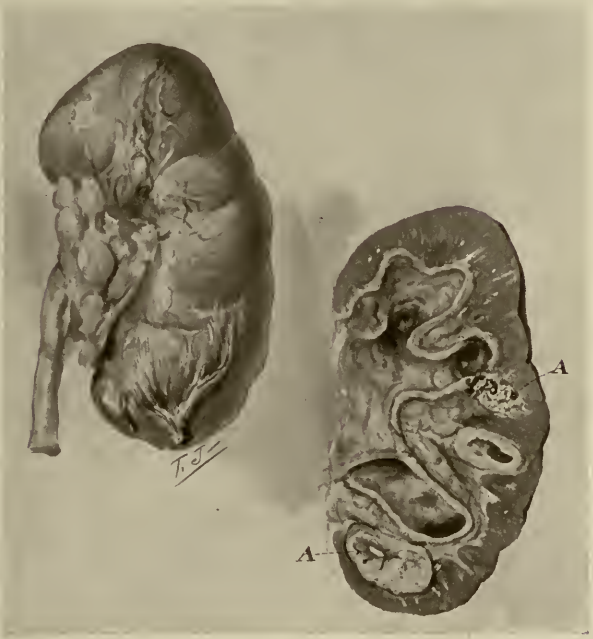

Fig. 435.—Appearance of external surface and of mesial longitudinal section of diseased kidney. The point of especial interest is the markedly dilated pelvis lined with tuberculous granulations and with associated destruction of renal papillæ. *A*, Caseous ulcerating tubercles.

I shall pass the specimen around for your inspection (Fig. 435).

Fig. 434.—Tuberculosis of the kidney: 8, Division of ureter with Paquelin cautery. The entire wound cavity has been packed with gauze to prevent contamination by possible leakage from the ureter; 9, removal of the perirenal fat; multiple ligatures are tied at the base of the fat flaps to insure against annoying and possibly dangerous oozing; 10, the wound is closed in layers, leaving space for a cigarette drain at one angle. The first row of stitches close the incision in the transversalis fascia. The rest of the muscles are included in the second layer.

CASE II

The second case I wish to present this morning is that of a female aged forty-one.

Present Complaint.—First, pain in bladder region and urethra, especially on urination. This condition has been present for five months. Second, backache (lumbosacral) when on her feet or upon slight exertion. This has been present for two years. Slight cough for one and one-half years.

Two years ago, in April, the patient noted a throbbing sensation in the region of the tip of the tenth rib. This would come and go and last only for a few minutes. It was not very regular in its appearance. The backaches would come on after the throbbing pain disappeared. Also on exertion she would have a severe aching pain in the left lumbosacral region. This backache has never been severe enough to compel her to go to bed, although she would be relieved when she would lie down. The pain is noticed whenever she is tired out, although lately it has not given her much distress.

Pain in the Bladder.—This came on in January, 1917, when she noted pain in the region of the bladder. The pain is burning in character and accompanies the act of urination. The burning is more marked at the end of urination, and is described as a drawing pain.

Frequency of Urination.—This has been present for one and one-half years. At first the frequency was not very severe, so that the patient was obliged to void every three hours and would arise once at night. The frequency has gradually increased in severity, so that now she is obliged to urinate every hour during the day and every half to three-quarters of an hour during the night.

Night-sweats.—Lately she has not been bothered with night-sweats, but formerly this was quite a pronounced symptom.

Previous Illnesses.—Five years ago the patient was operated upon for tuberculosis of the right ankle. Following the operation a sinus remained which discharged for three years.

Physical Examination.—*Head and Neck.*—Negative.

Chest.—Voice transmission at the left side anteriorly is diminished. Right upper lobe is a little dull posteriorly and a few subcrepitant râles are heard posteriorly. Heart is negative.

Abdomen.—Liver is slightly enlarged and extends fully one fingerbreadth below the costal margin. There is no bladder tenderness. The lower pole of the right kidney is palpable and the left kidney area is tender.

Lower Extremities.—Slight varicose veins present.

Cystoscopic Examination.—Two large areas of ulceration are seen behind the ureteral orifices. The ulcer which is situated near the left side of the bladder is irregular and covered with a grayish-looking slough. The margin of the ulcer is hyperemic. The left ureteral orifice seems a little edematous after the catheter has been inserted. This edema appears to be continuous with the previously described area of ulceration behind the left ureteral orifice. The right ureteral orifice is in front of the previously described ulceration and apparently is not connected with it.

Ureteral Catheterization.—The catheter on the left side passed rapidly into the renal pelvis and a prompt flow of urine was obtained. The urine was turbid and contained flakes. Catheterization of the right side was difficult. Several catheters were used without being able to pass any one more than 4 inches above the bladder. The patient was given a slight amount of nitrous oxid gas in order to overcome this apparent obstruction, but without avail.

Phenolsulphonephthalein Test.—Time of appearance: right, six minutes; left, twelve minutes. Output: right, 2.3 per cent.; left, 1.6 per cent.

Microscopic examination of urine shows the presence of tubercle bacilli in the specimen obtained from the left ureteral catheter.

Roentgen-ray examination for the presence of stone is negative.

Analysis of blood shows 11,500 leukocytes.

If we review the evidence I think one is justified in making a diagnosis of left-sided renal tuberculosis based on the following facts: The left kidney is tender. The second and most important symptom is that the urine from the left kidney shows on microscopic examination the presence of tubercle bacilli. A study of the renal function in this connection is interesting. We find that the right or supposedly well kidney excretes the phenolsulphonephthalein in six minutes, whereas the left or pathologic kidney does not eliminate the dye until twelve minutes have elapsed from the time of intravenous injection. A study of the total output of phenolsulphonephthalein, however, is somewhat at variance with the usual figures obtained in this class of cases. You notice that the right side, which is the well side, eliminates 2.3 per cent. of the dye in one hour, whereas the left or pathologic side eliminates only 1.6 per cent. The total function is 3.9 per cent. This, of course, would lead one to believe that both kidneys are doing a very small amount of work, and that the patient, eliminating only 3.9 per cent. of phenolsulphonephthalein, is in bad condition and perhaps on the verge of uremia. This, however, is not always true, and this case illustrates very beautifully the fact that the tests employed in determining renal function have certain limitations, just as any laboratory test has that we use in clinical surgery. The question might very properly be asked why does this patient have a total output of only 3.9 per cent.? It has been shown repeatedly that instrumentation may at times upset the renal function, so that if a subsequent test is carried out the normal figures are obtained. We have repeatedly, in cases of this kind, allowed the patient to return to bed and the next morning without any instrumentation repeated the thalein test. This invariably has shown figures up to normal, and there is one obvious conclusion, namely, that the presence of the catheters or the cystoscope, or both, may inhibit renal function. The opposite condition at times may occur, so that patients have polyuria as a result of instrumentation in which great quantities of colorless urine are eliminated within a very short time. In order to determine that this patient has a good function a second thalein test was carried out. This showed a combined function of 40 per cent., so that we can rest assured the renal function is quite up to normal and that the kidney which is to remain is capable, as far as we can tell by clinical tests, of carrying out the work of both kidneys.

In this instance it is not difficult to demonstrate the presence of another focus of tuberculosis. In this case the lesion that preceded the kidney lesion was an old tuberculous osteomyelitis of the ankle. In addition, we are able to demonstrate evidences of pulmonary disease.

Operation.—Owing to the fact that this patient has some pulmonary findings we will operate on her under gas-oxygen anesthesia. The dissection will be essentially that which you have just seen in the preceding case. Note that I am careful to give myself sufficient room in which to work by means of this liberal incision. I remove the kidney and as much of the ureter as I can conveniently in the usual way. No attempt is made to tie the artery and vein separately, but they are ligated *en masse.* I will remove as much of the perirenal fat as possible, as I believe that it may occasionally be the cause of persistent sinus formation.

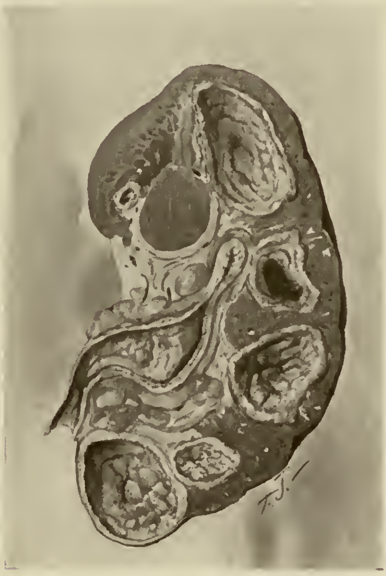

Fig. 436.—Mesial longitudinal section of kidney. Note large caseous tubercles in kidney parenchyma and thickening of wall of pelvis and ureter.

Large retractors are now inserted in order to inspect the cavity, looking for bleeding points and possible injury to the peritoneum. Having satisfied myself on these points, I will insert a cigarette drain down to the lower end of the wound cavity. I will now proceed to close the wound by closing the muscle layers separately with catgut. The skin I close with fine skin silk.

The specimen presents the typical picture of caseous and ulcerative renal tuberculosis (Fig. 436).

There is still a good deal of discussion as to the best way of treating the ureter and what should be done with the fatty capsule. Most men who operate for renal tuberculosis do not pay any attention to the presence of the perirenal fat. As I have already said, I believe that the fatty capsule deserves much more attention and consideration than is usually given it. One finds a great many different expressions of opinion on this subject and until comparatively recently the fatty capsule has been either ignored or sadly neglected. Many of our best text-books on surgical technic, genito-urinary surgery, and many of our books on general surgery do not refer to it at all in considering this subject. Just why it should be overlooked for so long a time is not quite clear to me. Many of the more recent writers attribute to it the possibility of being one of the causes of sinus formation after nephrectomy. These men do not believe that all the postoperative fistulæ or sinuses are due to the stump of the ureter, which is left behind. The clinical evidence of the involvement of the fatty capsule is seen in some of the late cases, where, at the time of operation, the fatty capsule can be recognized as being definitely pathologic, since it forms a hard mass, like cartilage. There are many men who believe that the fatty capsule is always more or less indurated and adherent to the kidney. These lesions may be purely of a simple inflammatory nature, but doubtless in a certain percentage of cases they are tuberculous. That they are tuberculous has been proved in many instances in which the fatty capsule was removed and examined histologically. Tubercles have been demonstrated in cases in which the fatty capsule looked perfectly normal to the naked eye.

Tuberculosis of the fatty capsule may be evident in cases where tuberculous granulations are seen on the surface of the kidney. Not only are tuberculous changes found in the cases in which the fatty capsule appears unaltered to the naked eye, but they are also found in the cases where the fibrous capsule of the kidney appears perfectly normal. These facts would appear to be rather conclusive arguments in favor of removing the perirenal fat, or as much of it as possible, in the cases of nephrectomy for tuberculosis. There may be exceptions to this rule, however, as in some cases it may be too difficult a problem to remove the fatty capsule without loss of time and danger of shock and hemorrhage. In such instances the fatty capsule must be left behind. This is especially so if the fatty capsule is hard and rigid, in which instance one may assume it has formed a protective wall before operation, and that it will continue to do so afterward. In these cases there may be the additional danger of injury to the peritoneum, with resulting tuberculous or even mixed septic infection of the peritoneal cavity if the capsule is removed. It is easy to see, therefore, that this question of the correct method of treating the fatty capsule is not a closed chapter.

Management of the Ureteral Stump.—The management of the ureteral stump has caused more discussion perhaps than any other phase of the subject, and is one which, up to the present time, has not been satisfactorily settled to all concerned. The many different ways of treating the ureter which have been advocated is ample proof that the ideal method has not been obtained. When nephrectomy was first recommended it was advised to remove more or less completely the entire diseased ureter. The more recent train of thought seems to be to remove only part of the ureter, as much as can be removed through the lumbar incision, and this generally means to the brim of the pelvis. At first it was advised to remove the entire ureter, including the bladder wall around the ureter. This method, however, soon fell into disfavor because it did not fulfil the claims of its advocates, because of the increased mortality rate, and because it did not prevent postoperative fistula. For a time it was advised to suture the ureter to the skin in order to treat the ureteral mucosa directly and so prevent infection of the wound with tuberculosis. Others advised suturing the ureteral stump to the muscles. Both of these procedures, I believe, have been given up by the men doing this class of work.

Many procedures have been recommended for the treatment of the ureteral mucosa; cauterization, electrolysis, and injections of carbolic acid have all been advised as well as the injection of tuberculin into the ureter. None appear to have outstanding merit.

Methods of Severing the Ureter.—These have also been varied. The ureter may be crushed with heavy forceps and cauterized with carbolic acid. Some prefer to burn through the ureter very slowly with the cautery. Invagination of the cut end of the ureter by purse-string suture, somewhat similar to the technic in appendectomy, has been suggested in order to secure a more thorough closure of the cut end, either with preliminary crushing of the ureter or with ligating. Ligation and invagination have been criticized because the end containing the ligature lies in the lumen of the ureter. Occasionally special treatment of the ureter is not necessary. This has been demonstrated by cases in which the ureter was simply cut off and allowed to retract. Personally, I never attempt extensive resections of the ureter, being satisfied to remove as much of the ureter as I can through the lumbar wound. Usually I am able to divide the ureter at the pelvic brim and occasionally just below it. As a rule I divide the ureter between heavy forceps. When I divide the ureter with the knife or scissors I always cauterize the end with pure carbolic acid, after having previously placed a ligature below the clamp, and then allow the stump to drop back into the wound. Recently I have been dividing the ureter with the Paquelin cautery. The objection to leaving a stump of the ureter has been that it continues to pour infectious material into the bladder, thereby infecting a clean bladder or delaying healing of an already infected bladder. I think that it will be difficult for any one to say that a stump a few inches longer or shorter will make very much difference. Attempts have been made to modify the technic according to the pathologic conditions of the ureter. If the ureter is thick and increased in circumference because of the thickening of its walls and if its lumen is small, it is a safe procedure, as a general rule, to resect as much as can easily be resected. These cases generally heal without fistula formation. If, however, the opposite condition is present, in which the ureter is thick and the lumen on cross-section dilated, I think it a good plan to carry out as complete a ureterectomy as possible.

CASE III

The third case we have this morning is Miss M. K., aged seventeen, by occupation a telephone operator, who complains of only three symptoms, namely, painful urination, frequency of urination, and bloody urine.

Present Complaint.—About eight months ago the patient experienced a burning pain over the bladder during the act of urination. This pain did not radiate down the thigh or back, but appeared very definitely localized to the bladder region. The pain has been gradually becoming worse, and at present it is intolerable even when she does not urinate, so that the pain now is present during urination and between urinations. For the past two months the patient has noticed that she has been obliged to urinate more frequently than before. Although this symptom has been noticed for only two months, there have been times during the day when she would be obliged to void as often as every ten minutes and at night she would get up five times to void. She has remained home for the past three weeks and since then does not have to urinate as frequently, this doubtless being due to the fact that she rests a good deal and is off her feet. The urine occasionally has shown the presence of blood, which the patient has been able to see with the naked eye.

Family history shows that one brother died of tuberculosis.

Physical Examination.—General examination shows a well-nourished young woman of seventeen who has not lost in weight.

Head and Neck.—Completely negative.

Chest.—Lungs are completely negative, as is the heart.

Abdomen.—Held rather rigid, so that examination is difficult.

The right kidney area is tender anteriorly and posteriorly—tender to palpation and also to percussion. There is slight tenderness also over the left kidney. There is no evidence of glandular tuberculosis.

Dr. Greer, who referred the patient to us, examined the urine at his office and was able to demonstrate the presence of pus and tubercle bacilli in the mixed urine, so that he brings her to us for the purpose of determining the origin of the pus and tubercle bacilli.

Roentgen-ray examination for the presence of stone is negative.

Cystoscopic Examination.—In the apex of the bladder are seen many small ulcerations. Large flakes of pus are adherent to the bladder wall. The right ureteral orifice is surrounded by a slight hyperemia and behind the right ureteral orifice are seen many tubercles. The left ureteral orifice appears normal.

Phenolsulphonephthalein Test.—Time of appearance: right, five minutes; left, five minutes. Output: right, 28.5 per cent.; left, 19 per cent.

Cultures of the urine obtained from the right and left ureteral catheters and bladder have remained sterile.

Cell Count on Urine.—

(*a*) Right ureter, 30 per cubic centimeter.
(*b*) Left ureter, 800 " "
(*c*) Bladder, 350 " "

This is interesting because in the cystoscopic picture tubercles are seen behind the right ureteral orifice. The ulcerating tubercles that are seen in the apex of the bladder occur not infrequently, and, of course, are of no value in aiding one to determine whether the tuberculosis is right or left sided. The presence of tubercles nearer the right ureteral orifice than the left would lead one to believe that the tuberculosis was right sided. This might furthermore be assumed because the right kidney is palpable. Therefore if one would be hasty in his conclusions and assume that, from the fact that the right kidney was enlarged and painful and tender and the tubercles were nearer the right ureteral orifice, that this patient was suffering from a right-sided tuberculosis, one would commit a very grave error, inasmuch as one would diagnose a right-sided tuberculosis, when, as a matter of fact, ureteral catheterization shows the right urine to be free from tubercle bacilli and the left urine to contain large quantities of tubercle bacilli and large amounts of pus. The phenolsulphonephthalein test shows a slight impairment of function on the left side.

From the evidence, therefore, my diagnosis is a left-sided renal tuberculosis, and I have advised the patient that an early nephrectomy should be carried out.

Operation.—Gas-ether anesthesia will be used, since the lungs, as far as we can determine, are free from active tuberculosis at this time. We will make our usual oblique posterior lateral incision, beginning one fingerbreadth below the last rib and carrying it well forward. The muscles are divided in the usual way and separated by traction with the fingers. The perirenal fat comes into view. The fatty capsule is picked up between two curved hemostats, nicked with a dissecting scissors, and opened. With my hand I have no difficulty in freeing the kidney and delivering the kidney into the wound. The kidney, after the fat has been removed with gauze, appears to be perfectly normal. There are no external evidences of tuberculosis. The lower pole seems, however, to be somewhat larger than the upper. When it is examined a little closer we see that it is smooth and enlarged and has a different color from the rest of the kidney. This does not look like tuberculosis and has the general appearance of a large urinary cyst, so that by looking at this kidney one would believe we had made an error in our diagnosis, as there is no evidence on the surface of the kidney of tuberculosis. This cyst which you see in the lower pole, of course, is not in any way responsible for the presence of the symptoms which she complains of, and is purely an accidental finding. Having cystoscoped this patient twice and having twice demonstrated tubercle bacilli in the urine from the left kidney, we may feel assured that we are dealing with tuberculosis of the kidney, and we are going to remove this kidney irrespective of the fact that there are no appearances of renal tuberculosis.

As I dissect and remove this fat, working my way toward the renal pelvis, I can feel that the ureter is very thick and very hard, so that this patient has a tuberculous ureter, which furthermore proves that this is the correct kidney to remove. I shall dissect the ureter from its bed with gauze as far forward as the brim of the pelvis.

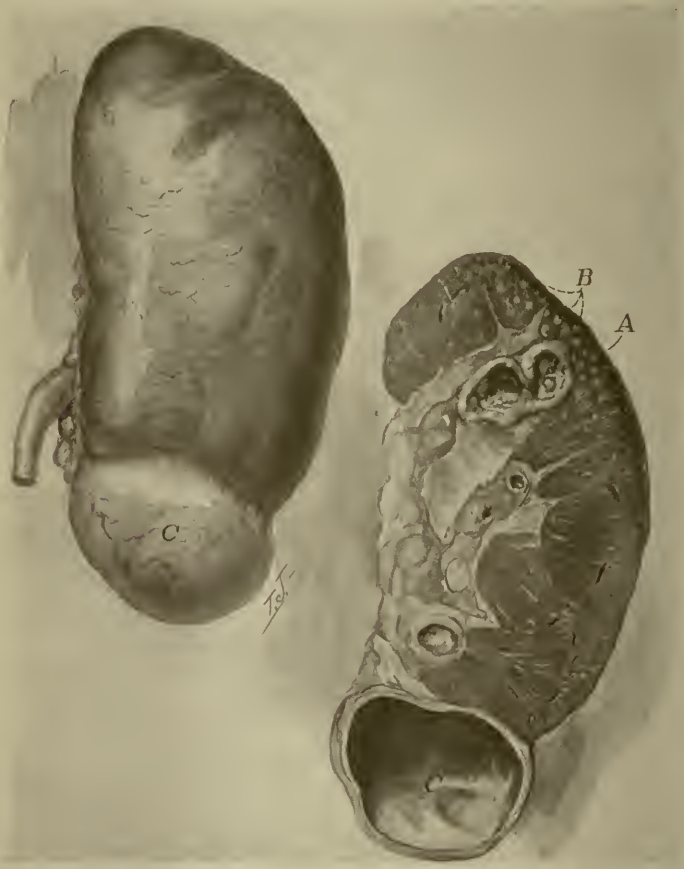

Fig. 437.—Kidney with urinary cyst in lower pole (*C*). The capsule is smooth and presents no evidence of tuberculosis. On the cut surface, however, are found numerous miliary tubercles (*B*) and one large focus of ulcerative tuberculosis.

NOTE.—The dissection was continued and the kidney with a portion of the ureter and most of the perirenal fat was removed as in the previous case. A cigarette drain was carried down to the stump and the wound closed in the usual manner in layers, the muscles with catgut, and the skin with silkworm-gut and skin silk.

On cutting into the kidney which I have removed we find abundant confirmation of our clinical diagnosis. Here, in the upper pole, are numerous miliary tubercles surrounding an area of ulcerative tuberculosis. The enlargement at the lower pole is, as we suspected, merely a urinary cyst and bears no relation to the active pathologic process for which we operated (Fig. 437).

CLINIC OF DR. LOUIS E. SCHMIDT

Alexian Brothers Hospital

A DEMONSTRATION AND DISCUSSION OF THE TECHNIC OF PROSTATECTOMY

(Given Before the Members of the American Urological Association, April 3d and 4th, 1917)

Summary: Discussion of the results obtained and presentation of the conclusions reached after a quarter of a century's intensive experience with prostatectomy; advantages of the suprapubic route—when the perineal route may be desirable; pre-operative care—points to be observed—methods of examination; choice of anesthetic—local infiltration for cystotomy and a gas-oxygen-ether mixture for enucleation best answer the indications; operative technic—dangers of unnecessary traumatism—how to prevent the formation of dead spaces—the two-step operation—control of hemorrhage—finger pressure; the Hagner bag; the Pilcher bag; the gauze pack; suture and fat transplantation; postoperative treatment.

At the outset I wish to state that I have nothing new to offer in connection with this operation; I have had experience for over twenty years with prostatic operations of all kinds, which will at least permit me to outline the different points of interest in connection with these 5 cases which I will operate on, and also to mention the various details of the procedures which I consider essential to the success of this operation.

At this time I will not discuss the advantages and disadvantages of the suprapubic and perineal operations. These are well understood and there are few differences of opinion. As far as I am concerned there are but comparatively few instances at the present time which are desirable to operate from the perineal route. The cases which have necessitated me to operate from below have been the small hard prostate, the prostate complicated with a fine stricture of the urethra, the prostate complicated with some form of abscess, prostatic or perineal in character, or a peri-urethritis, or if it is essential to attack the seminal vesicles, which can easily be carried out at the same time. Occasionally there are instances where perineal drainage may be more desirable than suprapubic, and then if the necessary relief is obtained, the second step can also be carried out through the perineal route.

Nor do I wish to outline the indications for prostatectomy, as there still is room for discussion. But in a general way indications are more easily advanced now, considering the results obtained by operation and comparing the results of bygone days when palliative treatment was carried out to the extreme limit. I believe it is true that if there were no mortality in connection with this operation all would easily agree on the indications.

In order to avoid unnecessary mortality it is well agreed that the patient should be put into the best condition possible before operation. There are but few instances where patients need immediate operative interference. Then only a drainage operation is carried out. This is done to allow the patients to recuperate and get into a physical condition which will permit the removal of the prostate without any unusual risk.

It is well never to hurry unless the indications are imperative. In all instances during the period of observation a careful differential examination is to be considered. Simply because more or less typical symptoms are present one must not forget that cancer of the prostate, seminal vesicles, and contracture of the neck of the bladder can give rise to practically similar cardinal symptoms as those of enlarged prostate.

Pre-operative Care.—There is no question whatsoever that pre-operative care and attention is as necessary for satisfactory results in this class of work as detailed postoperative care. For that reason I can urge every one to give as much care to the patient before as after the operation. This pre-operative care varies with different cases, as I shall demonstrate later. During the pre-operative period the surgeon is given the opportunity to make all the desired functional tests as well as to keep the patient under the necessary observation in order to become familiar with his condition, so that in case of accident or complication following operation better judgment can be used in the treatment.

The average care of the patient in those cases where no catheterization is necessary for the relief of retention should simply consist in keeping the functions of the patient active. Laxatives should be given freely, not sufficient, however, to irritate the intestines. The bowel movements must be free. Two and three nights before operation castor oil should be given. Warm baths sufficient to put the patient in a light perspiration are advised daily. Large quantities of fluid should be taken. I believe it is not desirable to give any diuretic drug unless absolutely necessary. If the quantity of urine before beginning the pre-operative care is below normal the quantity of fluid intake naturally should be increased until the patient secretes 2000 to 3000 c.c. in twenty-four hours. Urinary antiseptics should be prescribed. A certain amount of attention to the diet is desirable. However, as a rule, people operated upon for this condition have their set ways, and it is not particularly desirable to change their diet to any extent, yet no unnecessary amount of raw fruit, salads, or highly spiced foods or stimulants should be permitted.

During this period of time the ordinary functional tests should be carried out. The phenolsulphonephthalein test is the one of choice with most surgeons. However, I also have always added, and have had no reason to regret it, examination of the blood by cryoscopy. These two tests are easily carried out and certainly, in the light of our present-day knowledge, cannot be objectionable, although, of course, there is a question as to their value. In my opinion, however, these functional tests, considered in the light of the urinary findings by the usual method of examination —the total excretion for twenty-four hours, the total solids, the total nitrogen, urea, and other elements—add information the value of which cannot be disputed. Within the last few years, of course, the estimation of the urea, uric acid, creatinin, and total nitrogen of the blood have been introduced, and from personal experience and from the observations of others there is no doubt in my mind that definite information as to the powers of excretion of the kidney can be estimated. These blood examinations are most accurate, and I am inclined to believe should be seriously considered by every operator previous to undertaking operations, particularly on the aged. In addition to the detailed examination of the urinary apparatus, the period of pre-operative observation also affords opportunity for making the ordinary blood examination, to observe the temperature, the blood-pressure, and to cystoscope in order to acquaint oneself with the interior of the bladder. *x*-Ray examinations of the genito-urinary tract are always made as a routine practice.

The question of cystoscopy always comes up. I can particularly urge this mode of examination in every instance, provided it is carried out with every care as far as asepsis is concerned. If cystoscopy is carried out so as to cause traumatism and great pain to the individual, it is not unusual to cause slight complications that will necessitate attention. By cystoscopy one can find out the presence or absence of stone or tumor, two of the most common lesions which are encountered with large prostates, besides the attending complications, such as infection of the higher urinary tract, or local conditions which might also have something to do with the success of the operation. I have particular reference to diverticuli of the bladder. In those cases where the urine is sterile and where no catheters have ever been passed, I, as a rule, give the bladders several days of treatment with urotropin by mouth before examining with the cystoscope.

There is another class of cases which is of importance, particularly from the standpoint of pre-operative care. I have reference to those cases in which there is an enormous quantity of urine passed—often 7000 to 10,000 c.c. in twenty-four hours. There is frequently retention in these cases and the urine is sterile. Catheterization soon becomes necessary, and if kept up, which it must be unless contraindications are present, infection always takes place. These cases, in addition to the case mentioned, always demand the two-step operation, and the interval between the first and second steps should be sufficiently long. I can safely say the longer, the better.

The patients with chronic retention of urine who have been catheterized and who have either sterile or infected urine should receive the foregoing attention as well as the regular catheterization. The number of times of catheterization per day should depend on the quantity of retention. Four ounces or less should be catheterized at least once a day. Eight ounces or over should be catheterized fully twice a day, and in those instances where the patient has a still larger quantity of retention than the amount mentioned, he should be catheterized three times a day or oftener, as the case demands. If the bladder is infected there is no objection to irrigating with almost any of the various irrigating fluids.

In another series of cases where catheterization is not easy or where it is handicapped by traumatism and pain, it may be desirable to introduce a catheter and permit it to remain in place. If the permanent catheter does not give rise to any local or general symptoms, it may remain in place for days or even weeks. Naturally, if a urethritis is set up, frequent removal is necessary, or a suprapubic puncture can be made and the trocar left in place. In those cases where there is an enormous retention, but where no catheter has been introduced, the urine should always be drawn off gradually, but not suddenly. If there is cystitis, there is no objection to irrigating several times a day. It is true that both the indwelling catheter and the puncture have in former days taken the place of the first step of the two-step operation. At the same time, however, the indwelling catheter, as a rule, cannot take the place of the first step of the two-step operation. It is simply a preliminary step to the first step of the two-step operation. It is different, however, in the case of the trocar. If a sufficiently large trocar is introduced and allowed to remain in place, putting the patient into a comfortable condition without producing irritation, it may answer the same purpose as the first step of the two-step operation. The length of time that an indwelling catheter can remain in place is variable. In some instances catheters which give great comfort and produce no local disturbance may remain in place for days or even weeks, while in other instances the permanent catheter does not give the necessary relief, and is, in fact, a detriment to the progress of the case.

In these instances, therefore, as well as in those cases that are receiving the pre-operative care to the full extent, the patients are ready for the first step of the two-step operation.

Anesthetics.—The question of anesthetics is undoubtedly one of the greatest importance. From time to time various operators report the wonderful results they have had working with a particular anesthetic, and have practically given the credit to the anesthetic. Operators differ as to their point of view in regard to anesthetics. I might say they differ as much on this question as on the question of what method to use in operating on these prostatics.

I witnessed the beginning of the era of prostatectomy. I have noted the advantages in the various steps and procedures of this operation. I have also seen the various methods of anesthetizing the parts locally, as well as those of administering a general anesthetic. I have had the opportunity to see others work and to try out personally a large number of cases under every method of anesthesia, and for that reason I wish to express my opinion on this most important question.

I wish to state most emphatically that, after having seen the complications that may arise from the use of the various anesthetics, whether local or general, I have come to the positive conclusion, first, that the anesthetic should be given by an expert, and second, that local anesthesia for the first step and gas-oxygen-ether for the second answer completely the necessities of the general run of cases. It is true that gas anesthesia has its objections in the aged and that it has distinct contraindications. These, of course, must be observed. I have discarded every other anesthetic, except chloroform in some instances, in all of the second steps of the two-step operation or where I do a prostatectomy in one step. Naturally, in the first step of the two-step operation a local anesthesia is all that is necessary. I am under the impression that there are practically no objections to this method of anesthesia. There may be instances where it is not sufficient. Then it may be considered desirable to use a general anesthetic, and if so, such a one as aforementioned would be indicated. The local anesthetic which I use is the ordinary

Schleich's solution. The cocain in the Schleich's solution, of course, may be considered objectionable, but I have had no detrimental results with it.

Anesthesia by nerve-blocking methods has been advocated and practised by numerous operators, but in my opinion the complications and accidents resulting from their use have exceeded in frequency and importance those which may arise from the use of the anesthetic which I consider the anesthetic of choice. For instance, take spinal anesthesia. It is perfectly true that total anesthesia of the abdominal wall, bladder, and prostate can be obtained, and the latter can be removed without pain, but considering the condition into which the patient is put, the length of time that is required for him to again get into his normal condition, the anuria that may occur, and the pulmonary and cardiac complications that may arise—why use this anesthetic? The complications common to all anesthetics may occur here, and even such a local complication as injury to the coverings of the cord or to the cord itself have been reported. There are those who believe in the possibilities of anesthetizing the pelvis by the sacral method, and have constantly urged this procedure as the one method which has its advantages over all others. I can only state that this procedure, even in the hands of those men with the greatest experience, does not give complete anesthesia in much more than a majority of the cases. Its adherents claim 85 to 95 per cent. of successful anesthesia. By this method of inducing anesthesia where the abdominal wall does not become anesthetized the ordinary infiltration method, in addition, is always necessary in order to enter the bladder. In a large number of cases that I have seen where this method has been used the patient has had sufficient pain to necessitate the operator's resorting to a general anesthetic. Not only that, but here, as is the case with spinal anesthesia, local complications are not uncommon. I know of several instances where pain apparently along the sciatic nerve has persisted with such intensity that only morphin has been able to give relief. I know of many instances where the anesthetic was not sufficient to permit the beginning nor the completion of the operation, and a general anesthetic was also necessary.

It is out of the question for me to go into the minor technical details regarding the administration of both the local and general anesthetics that I have referred to, and also with regard to the scopolamin-morphin anesthesia which was popular years ago. Furthermore, I do not wish to discuss the advantages or disadvantages of these various methods at this time, but simply to impress on those who are here today my opinion as to their relative utility. For the past few years I have limited my anesthetics as has been mentioned, that is, Schleich's solution for opening the bladder and gas-oxygen-ether for the enucleation of the prostate. Occasionally one will meet with highly neurotic individuals who object to a local anesthetic. For these people the gas-oxygen-ether combination is entirely sufficient.

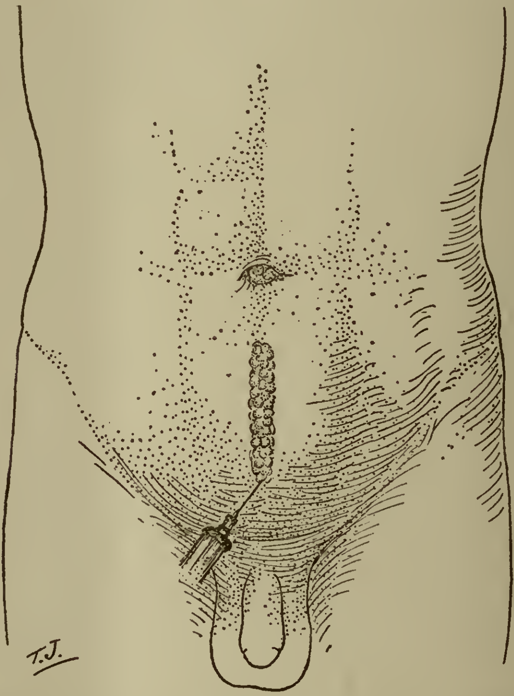

Fig. 438.—Infiltration of skin with Schleich's solution. The area infiltrated may include the distance from the umbilicus to the pubic fold, depending on the length of the incision to be made and also on whether a high or a low incision is planned.

Technic of the Operation.—As you will see by Fig. 438, I infiltrate carefully the median line from some distance above the pubis to within a short distance of the umbilicus (Fig. 439). Not only the skin, but the subcutaneous tissue, the superficial fascia, and the fat immediately below are infiltrated. I then incise to the fascia. I do not undermine either the upper or lower angle of the incision, nor do I separate the fat from the fascia on either side. If there are any small vessels that are bleeding,

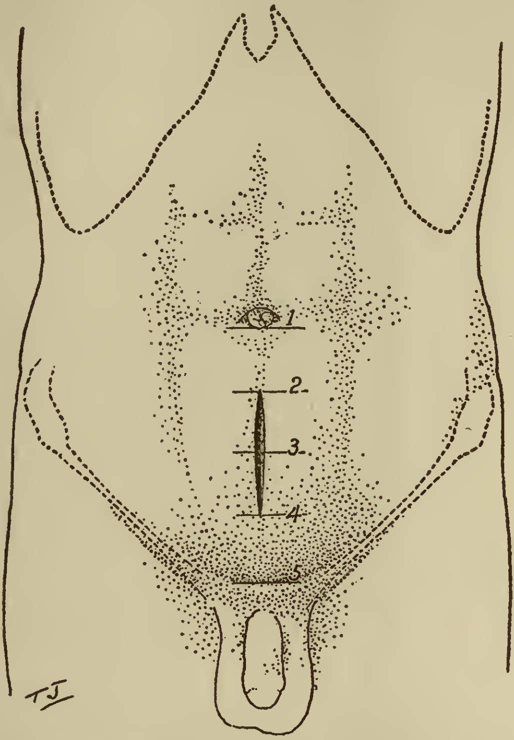

Fig. 439.—Diagram illustrating the proper length and location of the skin incision. When the bladder can be distended with 250 c.c. or more of fluid, an incision from 2 to 4 is desirable. If it is impossible to distend the bladder, an incision from 3 to 5 will be more serviceable. Incisions extending below 5 are unnecessary and often detrimental. The high incision is preferable, as the healing is more satisfactory, the immediate connection with the pubic arch being left undisturbed. Here also the bladder is much more easily attached to the abdominal wall.

crushing or, occasionally, tying off is desirable. Then the fascia is infiltrated (Fig. 440). By the introduction of the needle through the fascia directly into the muscle further infiltration is carried out. Then the incision is made through the fascia and the depressed muscle-fibers are exposed and separated without undue traumatism, so that the prevesical fat can be seen. It is just at this point that I wish to emphasize the fact that it is poor policy to push and pull the overlying thin fascia which is attached to the bladder in all directions. It is my practice to permit it to remain *in situ*. I then proceed to the infiltration of this fat (Fig. 441). I make an incision through the fat to the bladder, all the time not disturbing the fat and the tissues that lie between the bladder and the pubes. The bladder then comes into view and the fat is pushed aside, so that if there are any dilated and tortuous blood-vessels, which frequently are not un-

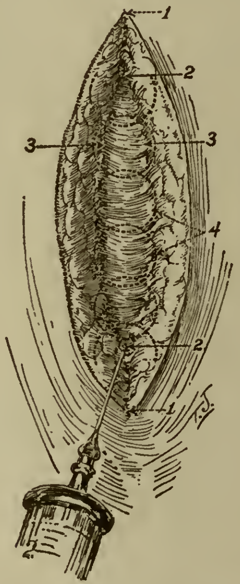

Fig. 440.—1–1 represents skin incision; 2–2 shows incision of fat—not as long as skin incision; 3, 3, fat pushed aside without loosening from fascia on either side; 4, wheals produced by infiltrating the fascia. The fascia is then split and the muscle infiltrated in the same manner, after which the muscle-fibers are carefully separated.

common, they can be readily seen. These vessels can easily be tied off (Figs. 442 and 443) at various points, so that there will be no hemorrhage when the incision is made into the bladder or if the vessels are otherwise injured. I make it a rule to distend the bladder. After the bladder has been thoroughly irrigated, if it is indicated to fill it at the time of preparation for operation,

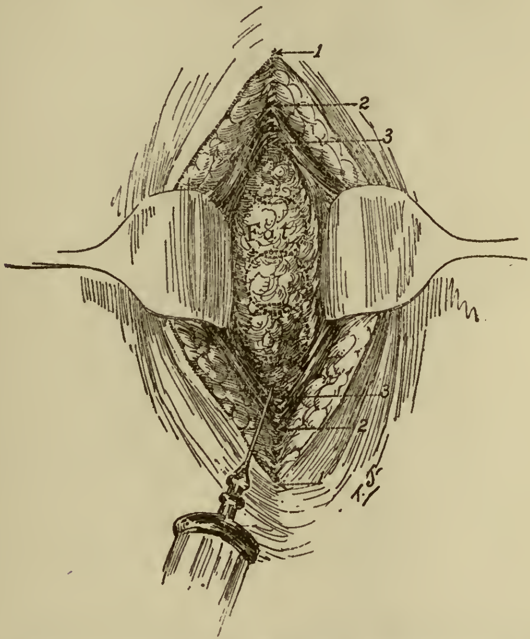

Fig. 441.—The muscle has been incised and the fibers are being separated by tractors, exposing the prevesical fat; the skin, fat, and fascia (1, 2, 3) are not separated from each other except at the line of incision. Observance of this precaution obviates the formation of pockets where infectious material may lodge. This sketch further shows the infiltration of the prevescial fat preparatory to incising it and exposing the bladder.

I distend the bladder with 250 to 350 c.c., sometimes more, of boric acid solution or sterile water. I only distend the bladder at this time in those cases that are tolerant. That includes most of the cases that have had chronic retention and the bladder is not irritable. In those cases where catheterization is painful and where the bladder is not easily distended, I distend the bladder at this point, that is, where the incision is just coming down to the prevesical fat, because if the bladder is distended with 250 c.c. at this stage, even though it is occasionally very uncomfortable to the patient, the duration of the distention will be so short that the transient discomfort may be ignored. In these cases I also at the time of preparation introduce a $\frac{1}{4}$-grain morphin suppository into the rectum. As a rule I do not attempt to anesthetize the interior of the bladder.

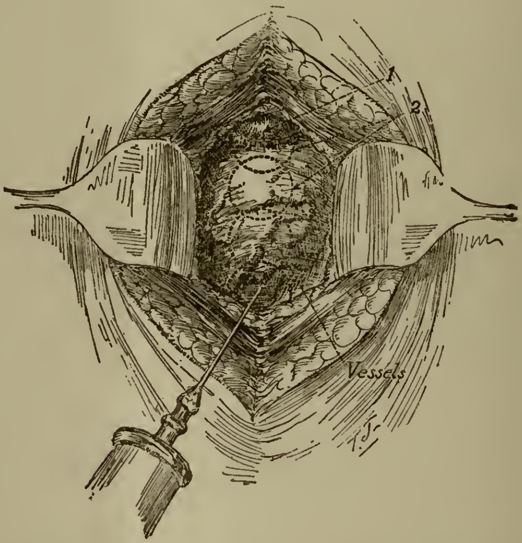

Fig. 442.—The prevesical fat has been incised and partly pushed aside, bringing the bladder and its radiating vessels into view: 1, The peritoneal fold pushed upward; 2, infiltration wheals in bladder wall.

I failed to mention the preparation of the skin. The ordinary bath and cleanliness are given to the patient the night before operation and sterile dressings applied. After the bladder has been thoroughly irrigated and distended, the skin is washed with alcohol-ether solution and several coats of 4 per cent. iodin solution are painted on the surface.

Regardless of whether the bladder has been distended previous to the commencement of the operation or is distended at the stage in the operation at which I am now, my next step is the infiltration of the bladder wall, which may be done very quickly. When the bladder is distended with 250 or 350 c.c., its vertex is brought up to within a few fingerbreadths of the umbilicus. In some instances, if the bladder is not distended to this extent, the peritoneal fold may be close to the pubes. If this is the case, it naturally becomes necessary to push the properitoneal fat upward, and this can be done easily without producing any pain if the prevesical fat and bladder have been infiltrated. At this time a retractor can be placed at the upper angle of the incision so as to keep the peritoneal fold from interference, because it is desirable to open the bladder as high up as possible, and sufficiently far away from this fold to insure against injury to it. This is done in order not to disturb the prevesical fat or the parts that are in

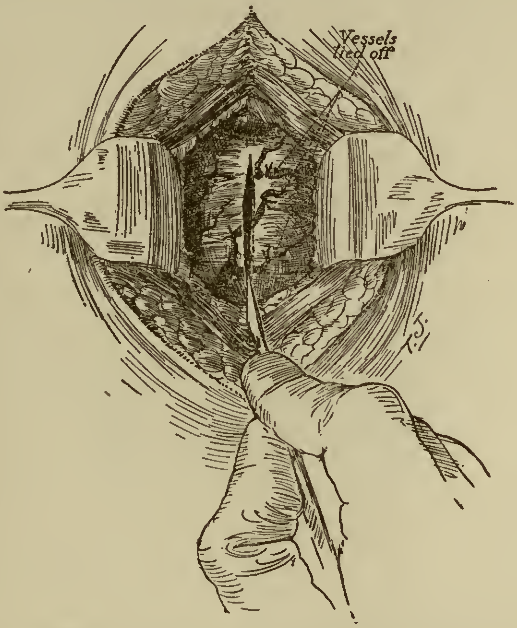

Fig. 443.—Any length incision into bladder can be made with an exposure of this kind. As long as there has been no unnecessary traumatism, no "guy rope" sutures need be introduced into the bladder, as all the different layers through which the incision has been carried remain attached to each other. Note vessels tied off with catgut.

direct connection with the pubes. If there is no objection, I frequently put in the so-called guy ropes (Fig. 444) on either side of the median line and as high up as the peritoneal fold will permit. If no fluid escapes, cutting needles are passed through the muscle, fat, and skin and a pair of forceps attached to the threads, thus holding the guy ropes taut. If fluid escapes from the bladder, I only place them through the bladder and hold them taut with the forceps. Then I take a scalpel with the blade pointing toward the pubes and make a sudden thrust and enter the bladder. Then with the index-finger (Fig. 444) of the right or left hand I follow the side of the scalpel and introduce the finger into the bladder. This step should be done with accurate knowledge of the anatomic conditions present, and when so carried out it affords a safe method of entering the bladder neatly and quickly. The scalpel is withdrawn, and with the index-

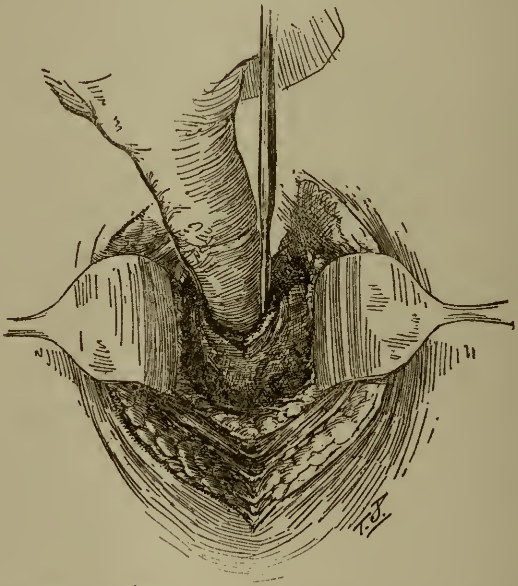

Fig. 444.—Proper method of incising bladder wall, using index-finger for tractor and as a guide. Whenever making a small incision or only a stab wound into the bladder the index-finger should be introduced through the incision before withdrawing the scalpel.

finger pulling upward and forward and holding the bladder in view the guy ropes can be laid aside and the bladder explored for stones or tumors, for the exact contour of the prostate, or the presence of diverticuli. If a previous cystoscopy has been made, this exploration with the index-finger is not necessary. The water which escapes can be swabbed up so as to preserve the neatness of the operative field. If there has been a marked infection of the bladder or if one is present at the time of operation, I introduce a trocar into the bladder (Fig. 445) instead of a scalpel, and empty it in this way so as not to permit the wound to become thoroughly saturated with the infected fluid. It has been advised to distend the bladder with air, but I have not been in the habit of so doing, as I find no particular advantage in the method. Whenever doing the operation of prostatectomy in one step, the bladder can be more thoroughly exposed if an incision of considerable length is made in preference to single puncture (Fig. 443).

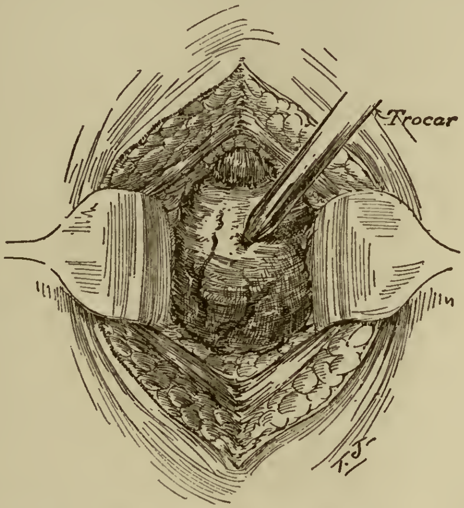

Fig. 445.—Bladder exposed, showing trocar being introduced in order to withdraw infected urine with the minimum risk of contaminating the wound. This illustration, as well as the previous ones, attempts to show that all layers of tissue remain in contact with each other except at line of incision. The more carefully this technical point is observed, the less the general reaction following operation and the more rapid and perfect is wound healing.

Here vessels are tied off at convenience and their ligation is a sound precautionary measure.

After the bladder has been emptied I pass a needle which is threaded to the guy ropes through the fascia and skin, practically up to the upper angle of the incision on both sides. This is done in order to make the second step of the two-step operation more safe from entering the peritoneal cavity by hitching the bladder as high up as possible and preventing the peritoneal fold from coming down over the bladder, thus permitting you to enlarge the opening of the bladder downward without necessarily detaching the bladder from the abdominal wall in the second operation. Now if the opening in the bladder is not large, I simply introduce in the first step of the two-step operation a Pezzer catheter (Fig. 446), and if there is no bleeding from the bladder wall oftentimes I do not find it necessary to introduce sutures to control the hemorrhage or to make the opening small enough to retain the catheter. In other instances, if the opening has been of some size, it may be necessary to introduce a suture above and below the catheter so that the catheter will be retained, and also at the same time to stop any hemorrhage from

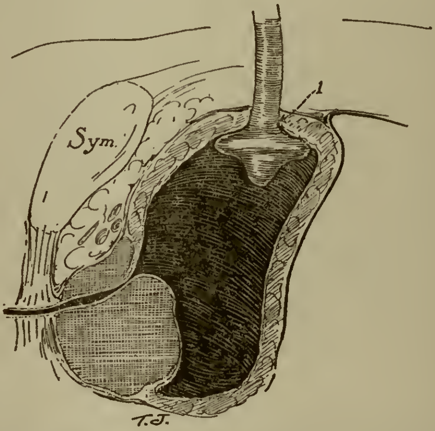

Fig. 446.—Pezzer catheter in position. This diagram shows the bladder attached to its normal surroundings, giving no chance for the accumulation of stagnant urine and secretions in the perivesical tissues, particularly between pubes and bladder. 1, Stab wound in bladder.

the bladder wall. If the bladder is drawn up to the upper angle of the incision it is not necessary to suture the fascia at this point. Occasionally, however, the fascia may be opened to a point higher than that to which the bladder may wisely be pulled. Then one or two sutures to close the fascia to the bladder may be necessary.

In this first step of the two-step operation the incision oftentimes, even in very stout individuals, is less than 2 inches in length. Therefore it may not be necessary even to suture the fascia at the lower angle. The skin with underlying fascia is brought together with silkworm-gut sutures. A little gauze dressing is placed over the wound with a tube protruding through the center and the gauze is covered with adhesive plaster. No further dressing is necessary. The patient is returned to bed.

I always advise the use of external heat, that the patient be wrapped up well when transported from operating room to his bed, and that hot liquids be given by mouth as soon as possible. If there is any discomfort, a hypodermic injection of morphin is given. I do not touch the dressings for two or three days, nor is the patient irrigated. On the fourth or fifth day the dressing is, as a rule, removed, and if a little gauze drain has been placed above and below the tube, this too is removed. If the dressings are stained on the second day, they are removed. The patient, as a rule, is up in a wheel-chair not later than the third day. On the fourth or fifth day the guy ropes are removed and the bladder is irrigated. In the course of eight or nine days the skin sutures are removed, and in most instances the wound is found to be thoroughly granulated around the catheter. Occasionally in infected cases the wound is gaping, and, if so, particular attention is given to it.

Now the question comes up as to how long a period should elapse between the first and second steps of the operation. Right at this point I want to say that the two-step operation is becoming more or less preferred by a considerable number of experienced men. I recall, however, in a personal conversation with Freyer in 1906 that he made the statement that he rarely ever considered a two-step operation desirable, and ordinarily saw no choice except in those cases where the patient was practically moribund. I might say that this was the general consensus of opinion at that time. I know that I rarely ever did a two-step operation in those days except in those cases where it was considered that the patient had practically no chance for recovery or where it was necessary to give him immediate relief. I believe with Lilienthal, of New York, who was really its first advocate in America, that the two-step operation should be advised in practically all cases. I was rather slow in convincing myself of the necessity of this. However, my experience in the past three years when studied in comparison to that of previous years induces me to make the statement that there are but few instances in which I do not consider the two-step operation the one of choice. To some extent I argue that if it is a desirable procedure for those who are seriously sick, I can see no objection to its being carried out with those who are in the best of condition. It certainly shortens the time required for convalescence from the second operation. The operation is divided into two parts, so that the shock that accompanies it is far less than when it is carried out in one step. We take advantage of this interval between the first and second steps to keep the patient's functions active and to make whatever observations are desirable. The phenolsulphonephthalein test and cryoscopy and all other examinations, already referred to, can be made use of as often as the individual case may require. From personal observation I can urge operators not to do these second steps too quickly. In those instances where the individual is in exceptionally good condition I never operate within ten to fourteen days. In those cases where the individual requires time to recuperate or where there is some cardiovascular or renal condition, or both, or even a pulmonary condition that demands attention, I have frequently permitted a period of three months to elapse. Naturally, during this time the patient should receive proper care in order to put him into the best of condition for the procedure which is to follow. It is not necessary to keep the patient in the hospital for the entire length of time during this period. Naturally, it is a matter of convenience to the surgeon. I have had occasion, however, to let the patient go home, and, if he came from a distance, to have the local physician see to it that the functions were kept active and the patient allowed to recuperate so as to gain the necessary strength and resistance for the next step of the operation. During such an interval the patient may be allowed the greatest freedom with regard to getting out-of-doors into the fresh air and sunshine, or he may be permitted to attend to business affairs. During this interval the Pezzer catheter may be removed as often as is necessary in order to keep the bladder and wound from becoming irritable and free from infection. In some instances the urine has a tendency to put deposits on the catheter, and to these patients I frequently give dilute hydrochloric acid daily, which I am inclined to believe has been of some benefit.

The second step of my operation is done under a general anesthetic using a gas-oxygen-ether mixture. The anesthetic is administered in the operating room, and as soon as the patient is under, I introduce a grooved director into the fistulous tract and then a scalpel along the curve of the grooved director, passing downward and incising all the overlying structures from the skin to the bladder. Then I immediately, without withdrawing the grooved director, pass the index-finger of my left hand into the viscus, and, holding the bladder upward and forward with this finger, incise the skin through to the fat, fascia, and muscle, along the line of the previous incision, finding it occasionally necessary to increase the length of incision in order to carry out the enucleation. Then, in order to be positive that the peritoneal fold has not come down, I carefully incise the bladder to such an extent that one can introduce two fingers of his right hand, at the same time withdrawing the index-finger of the left hand from the bladder. There is no objection, previous to the commencement of the enucleation, to again make a digital examination of the bladder. With the index-finger of the gloved right hand the enucleation is started. As a rule I introduce the index-finger as far back in the prostatic urethra as is possible, and with a little pressure motion from side to side the mucosa is easily detached and the line of cleavage found (Fig. 447). This can readily be distinguished by the ease with which the finger separates the prostate from the fascia in the line of cleavage. I

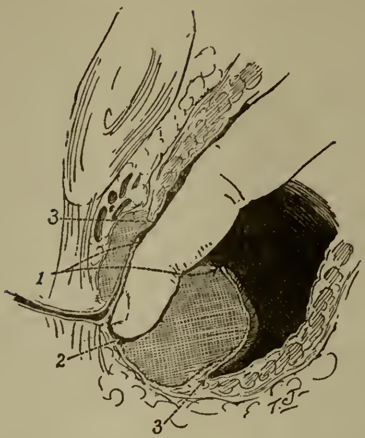

Fig. 447.—Enucleation of prostate: 1, Rent in mucosa and finger pushing in line of cleavage; 2, angle of urethra and apex of prostate at beginning of membranous urethra. It is at this point that extreme care should be given to remain in line of least resistance—*i. e.*, cleavage. In this illustration the larger portion of the prostate is in the bladder—*i. e.*, within the internal sphincter (2 and 3)—where enucleation can be carried out with ease.

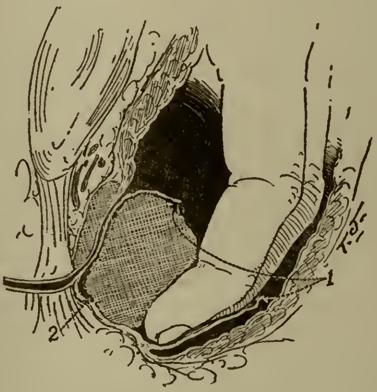

Fig. 448.—Enucleation of prostate: 1, Rent in mucosa and finger again following line of cleavage, but in a direction opposite to that shown in Fig. 447. This portion of the enucleation is carried out with ease, as the mucosa is only lightly adherent to the prostate. When the finger meets the portion already loosened at 2, it is easy to finish the enucleation, as the only requirement is to keep in line of cleavage. Naturally, this brings one over to the so-called anterior lobe. Oftentimes the entire prostate may be shelled out by simply continuing the finger dissection in the line of cleavage over the urethra and about the opposite lobe.

make an attempt, and, as a rule, succeed, to enucleate the apex of the prostate first on one (the superior) side by swinging the finger around forward as far as possible and then the apex of the opposite (inferior) side (Fig. 448). If it is impossible for me to swing my finger completely around I withdraw the index-finger and the next finger of my right hand, and introduce the corresponding fingers of the left hand at this point, thus permitting me to circle the complete area. The enucleation of the rest of the prostate is a matter of ease. It is my opinion that the crucial point is to commence the enucleation at the right location and to continue the enucleation until this apex portion of the prostate is separated (Fig. 449), because once in the line of cleavage and when this portion of the operation is successfully done the line of cleavage cannot be missed, the enucleation proceeds with the greatest of ease, for the simple reason that there is no semi-attachment of the mucosa to the prostate or of the prostate to the

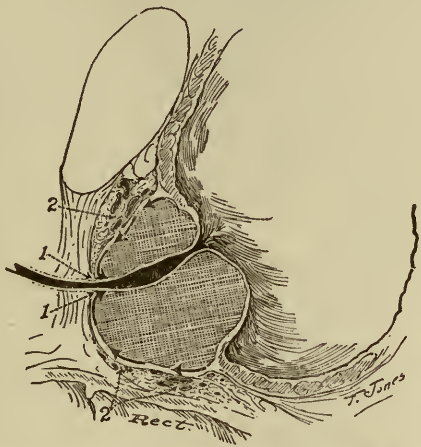

Fig. 449.—Diagram illustrating the direction in which the cleavage should be followed. If these angles are first attacked, 1–1, the prostate can be pushed forward and upward—not downward and backward—and so we may obviate the necessity of putting two fingers of opposite hand in the rectum. It is this technic which in my opinion has overcome the former terrible results of prostatectomy. The greatest amount of injury is always produced at this point, for the rest of the enucleation is done without any effort. 2, 2 are plexi of vessels, and if a tear extends through the fascia to these, hemorrhage and infection are to be expected.

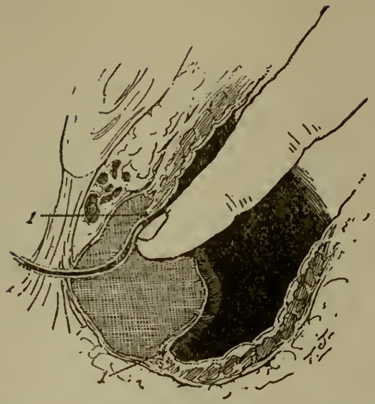

Fig. 450.—Enucleation of prostate. From 1 to 1 the diameter of the prostate is greater than at any other point. These prostates are easily removed after having been loosened from their beds. (Compare Fig. 451.)

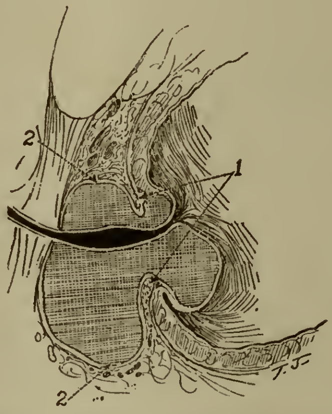

Fig. 451.—Enucleation of prostate: 1, The internal sphincter; 2–2 the greatest diameter of the prostate. These cases are difficult of enucleation in the manner described, because if more than one finger is used the sphincter is put on the stretch or even torn, and temporary or even permanent incontinence may result. Also contractures of the internal urethral orifice may follow if infection occurs. This illustration may be considered as exaggerated, but the type is frequently met with. These are the ones fraught not only with the complications mentioned, but in which also the enucleation is difficult.

fascia as at the apex of the prostate, or to the urethra and membranous urethra. If the prostate (Fig. 450) is of such a character that the internal sphincter does not produce a zone of contraction at any point, it is easily removed without undue trauma. In some instances (Fig. 451) I have lost considerable time in removing the prostate because the contraction of the internal sphincter was of such intensity that it was not easy to introduce two fingers or sometimes even one finger into the urethra and enucleate the prostate as outlined. Sometimes the constriction is so tightly drawn that the body of the prostate can scarcely be brought through this constricted area even with the aid of forceps, and in these instances it becomes necessary to remove the prostate (Fig. 452) in two or more portions.

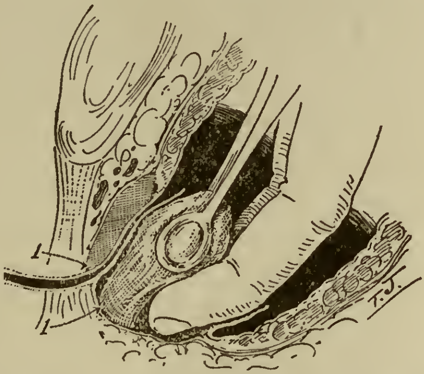

Fig. 452.—Enucleation of prostate. On account of the difficulty of the enucleation at the apex in cases of this type, forceps are used to grasp the portion of the prostate already loosened, and by pressure and slight tension to elongate the prostate and so make it possible for the finger-tips to remain in the line of cleavage. It is an infallible rule never to pull and twist and so tear the prostate from its bed. The finger should always remain in line of cleavage and loosen every portion of the prostate. Those that do not follow this rule are those that most often must resort to methods for the stopping of hemorrhage. Besides, I personally believe that if this rule is not followed, it is just these cases that suffer from shock and hemorrhage, and are then so commonly followed by death.

The question of hemorrhage is undoubtedly one of the greatest importance in these old people. Therefore a careful enucleation without traumatism is the one thing in my mind which makes the operation one of comparative safety. In the enucleation I assume the eye of the individual is on the tip of the index-finger, and if one enucleates under direct sight, unnecessary traumatism is not produced. Personally, I rarely ever have used the fingers of the opposite hand in the rectum in order to steady the prostate. I believe that if one uses such an amount of effort that it becomes a necessity to steady the prostate with the fingers of the opposite hand while doing the enucleation, one is not sufficiently familiar with the anatomic relationship of the parts to undertake the operation in the first place. If the enucleation is commenced in the way I have outlined, this help of the fingers of the opposite hand is not necessary in my experience, but is even detrimental. There is no objection, I might say, to starting the enucleation in any portion of the prostate that protrudes into the bladder. The various methods that have been shown from time to time of where to start the enucleation, going through the mucosa over either of the protruding lobes or in a semicircular line, are unnecessary. The chief point is not to injure the sphincter at the point where it surrounds the prostate. It is a good omen after enucleation, showing that there has been no traumatism to the sphincter, if the sphincter contracts down so that practically only a dimple is seen. If this occurs after one has removed a large prostate where there has been a constriction, as already mentioned, it is positive evidence that there has been no injury to the sphincter. These individuals quickly recover the power of urinating. If the enucleation has thus been carried out and there are no fibers of muscular tissue from the bladder adherent to the prostate, one need not have any great fear of a severe hemorrhage from this portion. If the prostate shows no evidence of muscular tissue, there can be no hemorrhage from the vessels supplying the muscular tissue of the bladder. Occasionally there are varicosities in the mucosa at this point, and these are occasionally torn in the course of enucleation and may produce hemorrhage. However, as already stated, if the sphincter has not been injured, it is active and naturally tends to check any hemorrhage that may come from these varicosities. If the prostate shows tip-like or string-like attachments at the apex, which represents that portion of the prostate adjoining the membranous urethra, it means that there may have been considerable traumatism to the tip of the urethra, and from this point hemorrhages of considerable severity are known to take place. Furthermore, hemorrhages will occur if one gets outside of the line of cleavage and tears through the fascia, traumatizing the vesicorectal and other plexi. This accident should never occur, and if it does, though no pronounced infection is present at the time, it becomes, as a rule, a source of chronic sepsis. Occasionally recovery in prolonged convalescence results, but it oftentimes leads to death.

In the management of hemorrhage there have been various procedures advised. It is desirable if possible to ascertain the source of the hemorrhage. If it is from the musculature at the point of the internal sphincter or from the varicosities just referred to, purse-string sutures that do not make a closure of the internal urethral orifice have been advised, or individual interrupted sutures at various points deemed necessary will frequently stop a severe hemorrhage. Hemorrhages that occur from any point within the sphincter may be controlled by finger pressure (Fig. 453), but are probably best controlled either by packing with gauze or by any one of the bags that have been advised. As this is an important question I think it desirable to show how the Hagner bag is introduced and made effective. A catheter is introduced through the urethra into the bladder and

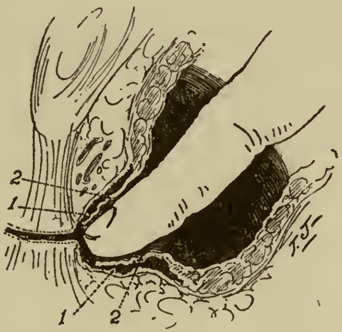

Fig. 453.—Enucleation of prostate. Methods of controlling hemorrhage. If hemorrhages take place from within or adjoining the cavity, the mucosa (2–2) is pushed so as to cover the raw surface (1–1). Simple pressure with finger or gauze may stop slight hemorrhage. Before making such pressure sterile water at a temperature of 115° to 120° F. will often be of great help. Freyer even advised counterpressure with two fingers in the rectum against the finger, shown in the illustration.

the rubber tubing of the bag is then drawn through the urethra, and to it is attached a syringe which is filled with water. The bag is then gradually drawn into the cavity so that the edges of the bladder are held in place. The rubber tubing is drawn tightly downward so that the water cannot escape. Sufficient water is then introduced into the bulb so as to distend and exert pressure, and the tubing is held in place with bands of adhesive plaster that are placed around the thigh. The Pilcher bag (Fig. 454), which is a modification of the Hagner bag, is introduced into the cavity in the same way. However, this bag is distended through a small rubber tubing which passes outward through the suprapubic opening instead of through the urethra. The degree of distention to which the bag is subjected is governed by the facility with which the hemorrhage is controlled. It may be necessary to distend it to the maximum capacity of the bladder.

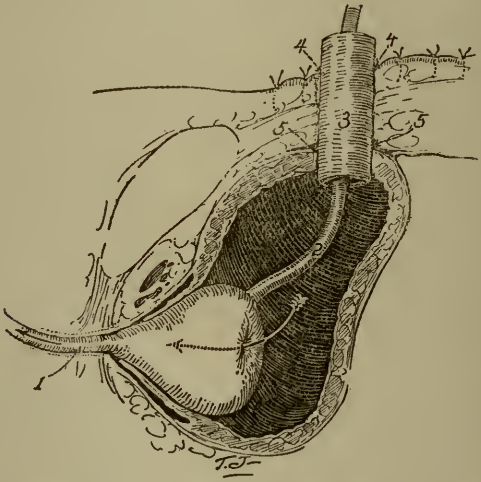

Fig. 454.—Enucleation of the prostate. Methods of controlling hemorrhage. The Pilcher bag in place; 1 represents the catheter permitting drainage; 2, tubing used to inflate the bag; 3, drainage-tube through which inflation tube is drawn.

One of the best methods of packing the cavity is as Cabot has suggested. A catheter (Fig. 455) is introduced through the urethra into the bladder and a gauze strip 5 yards long, or longer, is drawn through the wound and tightly attached to the bladder end of the catheter and the catheter withdrawn. The string protrudes from the urethral orifice, and not only is the gauze packed into the cavity where the prostate was, but the mucous membrane is also introduced into the cavity, so that it forms a vesical-shaped opening. The gauze is introduced so as to keep the mucous membrane in place when the bladder is distended with gauze (Fig. 456), thus exerting pressure on the edge of the mucosa in the same manner as the bags.

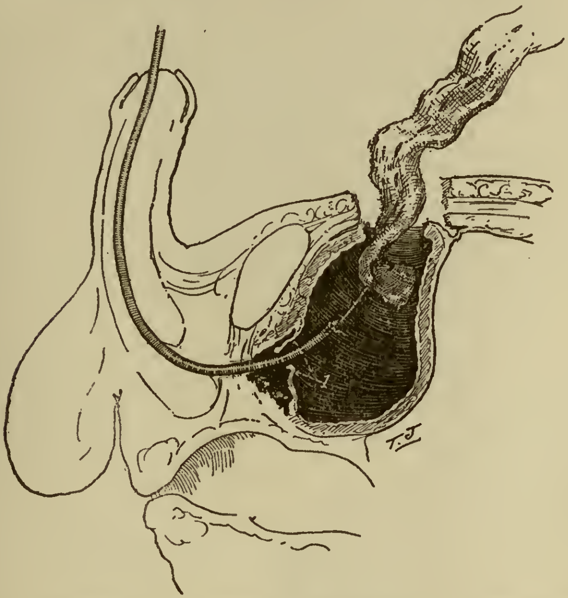

Fig. 455.—Enucleation of prostate. Methods of controlling hemorrhage. Packing the cavity with gauze. When the catheter is withdrawn from the urethra the gauze is packed snugly against the flaps of mucous membrane (1) by means of the string which has been threaded loosely through the gauze and anchored toward the end of the strip opposite to that which first enters the bladder.

There is one other method which I wish to refer to. Kolischer and others have advocated taking large pieces of fat from under the skin of the suprapubic wound and introducing them into the cavity and suturing them in place (Fig. 457). This is done with the object of securing the hemostatic action of the fat. Kolischer and others who have used this method are strong advocates of it.

Personally, I have used the bags or packings in preference to the fat. However, it must be admitted that the bags or packings must be removed, and at these times secondary hemorrhages may occur, although I have never encountered any. I wish to state

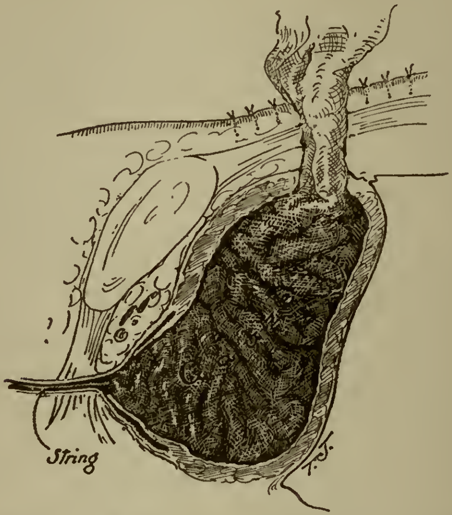

Fig. 456.—Enucleation of the prostate. Methods of controlling hemorrhage—packing the cavity with gauze. When using gauze for purposes of this kind the bladder is also distended. This is not the case when bags are used. In these cases no drainage-tube is required.

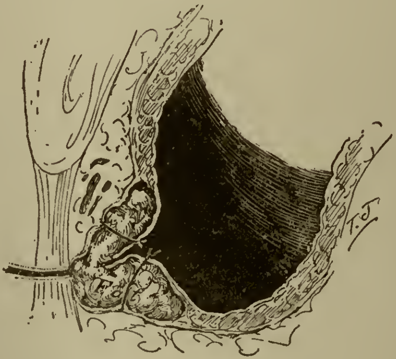

Fig. 457.—Enucleation of the prostate. Methods of controlling hemorrhage—the transplantation of fat. Fat is sutured in the cavity in contact with the bleeding surfaces in order to obtain the benefit of its hemostatic influence.

that in the large number of cases in which I have used the packing or bags I have never seen hemorrhage of any alarming extent. It is true that I have had hemorrhages ten to fourteen days after operation in cases where I have not packed or used the bags. When you apply the bags or packings you distend the internal sphincter and prevent it from contracting. This may cause intense pain. This symptom may be of such intensity that morphin frequently will not control it, or, if it does, unusual amounts are necessary. On the other hand, in some instances there will be no great discomfort. If the bags are used, the degree of distention can be regulated by varying the amount of fluid which they contain, and in this manner one may strike a balance whereby the pain may be relieved and the pressure still be sufficient to control the hemorrhage. However, I have found that if the pains are intense, it usually becomes necessary not only to permit the fluid to escape but also to remove the bags, and this is a great disadvantage in comparison with the method of Kolischer. There is no question that where fat is used these symptoms do not occur, nor is it necessary to remove the fat, since it is soon completely absorbed.

If there is no unusual amount of pain the packings or bags are allowed to remain in place forty-eight to sixty hours. Oftentimes the pressure is reduced at the end of thirty-six hours and the bags withdrawn at the end of forty-eight hours. In cases in which hemorrhage occurs regardless of whether packing or bags have been used, I always use horse-serum subcutaneously—20 c.c. at once and repeated in the course of two or three hours if bleeding continues. If the pulse remains small and fast after removal to bed, I give hypodermoclysis of 1 c.c. of 1 : 1000 adrenalin solution to 1000 c.c. of normal salt. This can be repeated at once, and if indication continues, more saline can be given. Coagulose and other preparations have not given as satisfactory results as horse-serum.

At the end of thirty-six hours if a tube has been introduced, it can be removed, when a smaller tube or, still better, a Pezzer catheter may be introduced. In those cases where no packing or bag is introduced I frequently irrigate the bladder with water at a temperature of 115° to 120° F. Retractors can always be introduced in order to observe directly whether or not there is any hemorrhage. I always consider it a good point when the blood clots quickly, and in these instances naturally no mechanical methods are necessary to stop hemorrhage. A $\frac{1}{2}$-inch rubber tube with some lateral openings at the lower end is introduced into the bladder. If the bladder contracts snugly around the tube, no sutures are used. I do not suture the tube to the bladder, but I sew the bladder to the abdominal wall above and below the tube. The illustration shows this procedure (Fig. 458). The needle passes through the fascia to one side of the median line, picks up a portion of the bladder, and then passes to the opposite side of the median line and takes up another portion of the bladder, and then out through the fascia. I do this above and below. This brings the bladder to the abdominal wall and

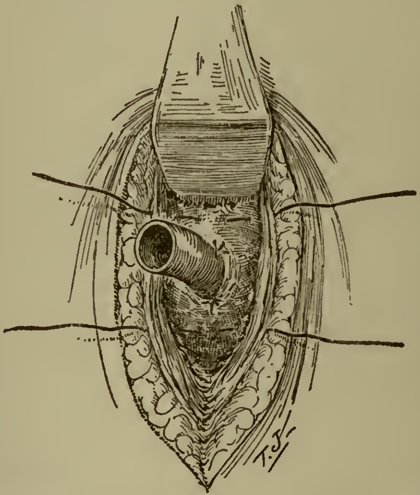

Fig. 458.—Enucleation of the prostate. Closure of the wound and drainage. This illustration shows how the bladder is attached to the abdominal wall, and how all dead spaces are obliterated. Here the opening in the bladder is closed with sutures above and below the drainage-tube. With the untied sutures, which are seen passing through bladder wall and fascia, the fascia is brought together and the bladder is securely attached to it. Sutures may be used to bring the edges of fascia into apposition if necessary. (Compare Fig. 459.)

ordinarily obliterates any space wherein secretion or urine can collect. One of the points that I wish to bring out is that the bladder should not be unnecessarily loosened from its moorings. The bladder should not be disturbed and separated so that it will be loose in the pelvis, but should remain attached to the surrounding tissues except at the point of incision. If necessary, one or two other sutures can be put in above and below the first line of sutures in order to bring the fascia together (Fig. 459). Occasionally it is desirable to place a little gauze drainage above and below the tube. If there are any spaces which have been produced by loosening the bladder, small rubber drains can be introduced and allowed to remain in place for twenty-four hours. The superficial fascia and skin are then brought to-

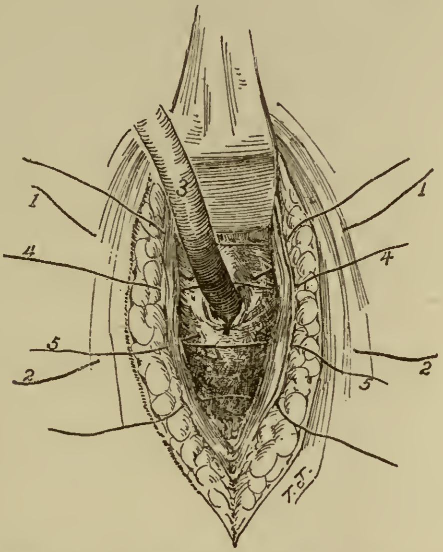

Fig. 459.—Enucleation of the prostate. Closure of wound and drainage. 1–1 and 2–2, Guy rope sutures which are used at the time of the first step. These guy rope sutures can also be used at the time of the second step if the bladder has been unnecessarily loosened during the operation, in order to steady the bladder and also to help obliterate dead spaces. The surface of the bladder should always remain under the musculature and never be drawn upward through the muscle to the fascia. This delays healing and tends to the establishment of obstinate fistulæ. 4–4 and 5–5, Sutures bringing fascia together.

gether and sutured. The guy ropes should also be tied with pieces of gauze under them.

Postoperative Care.—No local attention is given to the bladder for the first three to five days. Then the bladder is irrigated through the suprapubic tube. At the end of five days or less the tube is removed unless a Pezzer catheter has been introduced at the time of operation. However, I rarely do this, but prefer a fair-sized tube at first. A Pezzer catheter is then introduced to allow the wound to get smaller, and is removed at the end of ten to fourteen days and the fistula allowed to close. At the end of ten days after the catheter has been removed catheters are introduced into the bladder per urethra and irrigations are made if infection is present. Otherwise the irrigations are not carried out with any regularity. I am in the habit of using weak iodin solution for the ordinary general purpose of keeping the bladder clean. If infection is present I prefer 1 : 10,000 to 1 : 5000 nitrate of silver solution for daily irrigations. Occasionally a permanent catheter is introduced into the bladder per urethra, with the idea of preventing the suprapubic drainage, so that the patient, not being wet continually, will be more comfortable. It is not done with the idea that the fistula will close with any greater rapidity.

Naturally, here again some of the wounds become infected. If so, they are allowed to close by granulation. In such cases it is not uncommon for the fistula to remain open for a considerable period of time. As a rule I do not urge the patients to get up quickly, and I practically treat them in exactly the same way as after the first step of the two-step operation. If the tube is removed and the Pezzer catheter introduced on the third to the fifth day, the patient is allowed to get up in a wheel-chair. I have seen no advantage, and, in fact, there are many instances in which it is detrimental, for the patients to get out of bed too quickly, although it is desirable to have the patients, particularly those who are old and decrepit, sit up the same day of the operation unless some distinct contraindication is present.

As far as the results are concerned, I believe that the mortality is reduced to a minimum by the two-step operation and by the system of preliminary care as outlined; and second, the functional results are most gratifying. In several thousand cases of prostatectomy of all kinds—by the perineal and by the suprapubic route—I have seen less complications following the suprapubic operation and particularly the two-step operation. Furthermore, following this operation, unless a diverticulum is present, the bladder empties itself completely, and in practically all instances the bladder is freed from cystitis unless an infection involving the muscular wall has been present.

CLINIC OF DR. ALBERT J. OCHSNER

Augustana Hospital

ACTINOMYCOSIS OF THE COLON; ILEOSIGMOIDOSTOMY; TREATMENT OF ACTINOMYCOSIS

Summary: A patient presenting a large, tender, nodular intra-abdominal mass associated with marked loss of weight, weakness, pain in the abdomen, and the passage of blood, mucus, and pus containing numerous colonies of actinomyces with the stools; technic of ileocolostomy; advantages of end-to-side over lateral anastomosis; administration of potassium iodid in cases of actinomycosis; importance of local pathologic defects about the mouth and throat as atria for infection.

History.—The patient, a married man of forty-four years, was admitted to the hospital December 15, 1916.

His family history is negative. He had a Neisserian infection twenty-five years ago. He drinks a considerable quantity of beer. He has lost 50 pounds in weight since July 15, 1916.

In July, 1916, while working in a camp, he gradually became weak and had no appetite. The latter part of July he passed a large quantity of bright red blood per rectum, after which he felt much weaker and restless. For the next day or two the stools were black and tarry in appearance. He has passed blood three or four times since then, and the stools usually contain mucus and pus. At first he vomited, even water producing nausea and vomiting. The vomitus never contained blood or coffee-ground material. He belches considerable gas. There is a constant aching pain in the left mid-epigastrium and sometimes he has an aching in the left shoulder and across the lower lumbar region. Occasionally, not every day, but twice yesterday, he has real sharp severe knife-cutting pain, which originates in the upper left abdomen and shoots down into the glans penis. Food does not relieve the pain, but produces a heavy feeling. He has never been jaundiced. He has some frequency of urination with a scanty amount. Urinates two or three times at night. No blood has been present in the urine. At times he coughs and expectorates some mucus, but no blood. He gets weak and has some dyspnea on exertion.

Physical Examination.—The patient is a fairly well-developed and still moderately obese male, with a fair color and some flushing of the face. His skin is dry. The eyes react to light and accommodation. There is no nystagmus. There is some pyorrhea. The neck, chest, heart, and lungs are negative. The liver border is 1 inch below the costal margin and tender. There is moderate tenderness with spasm over the gall-bladder area, and also moderate tenderness with spasm in the midline, midway between the umbilicus and the symphysis. The kidneys are not palpable. An indefinite tumor mass, very tender and painful, with adjacent smaller tender nodules, can be felt opposite the umbilicus and to the left side. There is also moderate tenderness down toward the left pubis. Rectal examination shows several large external hemorrhoids present. The prostate is markedly enlarged, especially the left lobe. Proctoscopic examination is negative. There is an induration at the point of crossing of the descending colon and ureter.

Comments and Operation.—Dr. Ochsner (December 18, 1916): In this patient we have a tumor beginning on the proximal side of the splenic flexure of the colon and extending well beyond the splenic flexure, causing quite a marked obstruction. It has the feeling of an inflammatory growth. The mesenteric lymph-nodes are greatly enlarged, the largest one being 3 cm. long and 1 cm. thick. The mesenteric lymph-nodes not only of the transverse mesocolon but also of the jejunum and upper portion of the ileum are involved. Consequently, it is not possible to remove this growth safely. Moreover, it is not necessary that the growth be removed surgically. In the first place, this growth has all the characteristics of an inflammatory granuloma, and, second, we have repeatedly demonstrated colonies of ray-fungi—actinomyces—in the pus which this man passes per rectum. We, therefore, make the diagnosis of actinomycosis of the bowel with obstruction. This growth being of inflammatory origin—due to actinomycosis—it is likely that the obstruction which it produces will later subside under the influence of the treatment which I shall describe later, the object of our present operation being to relieve the obstruction which is endangering the patient's life.

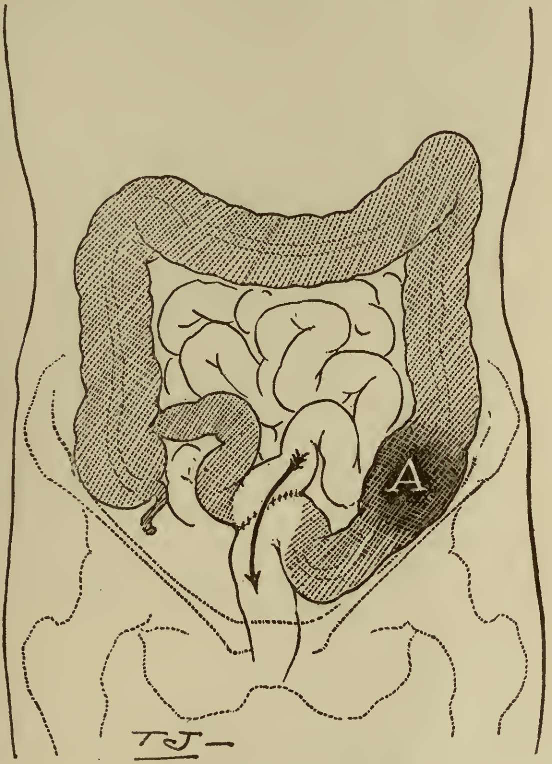

Fig. 460.—Actinomycosis of the descending colon. *A* marks site of lesion. The arrow indicates the anastomosis. The shaded area of the terminal ileum and colon represents the portion of bowel short-circuited by ileosigmoidostomy.

Consequently, we will make a side-to-side anastomosis between the ileum and the sigmoid, taking a portion of the ileum 20 cm. away from the ileocecal valve and attaching it to the sigmoid flexure just above the beginning of the rectum (Fig. 460). We make our anastomosis $7\frac{1}{2}$ cm. long, so that there cannot possibly be any obstruction later.

For fear of injuring the intestinal wall we do not apply a clamp. As our first step we unite the two segments of bowel by a continuous fine silk Lembert suture before we make the incision. Second, we incise the intestine along the edge of this suture line, cutting through the serous layer and the muscular layer down to, but not through, the mucous membrane. Then we apply the next row of sutures, which is a through-and-through layer of chromicized gut, made, however, without opening the intestinal canal. These sutures are placed closely enough so that there cannot possibly be any hemorrhage. After placing this lower row of sutures we open the lumen of the sigmoid and the ileum and cleanse the wound with moist sponges, being very careful not to traumatize the intestine. Then we continue the catgut suture anteriorly until it reaches its starting-point. This suture, which includes all the layer of the bowel wall, causes an accurate coaptation of the surfaces, and is absolutely certain to prevent hemorrhage. Then we place two interrupted silk sutures, but before we apply these we sponge the surfaces of the suture line carefully for any particles of intestinal contents that might have been carried through by means of the suture, and we remove the gauze pads which we had placed about the intestine for the same reason. Then we place two little interrupted silk Lembert sutures which will completely cover up the ends of the chromicized catgut. This gives us one complete row of chromicized catgut sutures, which would undoubtedly be sufficient, but there certainly can be no harm in placing a row of fine silk Lembert sutures over this so long as one is careful not to catch the intestinal wall too deeply and thus interfere with the size of the opening or with the circulation. For this reason we pick up the primary silk suture with which we made the posterior Lembert suture and carry this on around so that our entire wall is covered with one continuous row of Lembert sutures and one continuous row of Connell sutures. At one point I have placed three additional little interrupted sutures of silk, because at this point the wound did not appear quite as secure as we would like to have it.

In making an ileocolostomy I usually prefer to sever the ileum and to implant the proximal end into the side of the sigmoid, since it has been pointed out by Percy, Lane, and others that a lateral anastomosis is not so satisfactory. A lateral anastomosis may permit some of the fecal material to pass on into the cecum instead of short-circuiting, and the opening may fail to functionate at all. Again, if we close the ends of the severed ileum and make a side-to-side anastomosis between the sigmoid at the upper end of the rectum and the proximal segment of the ileum, the closed end of the ileum may form a pouch in which feces may accumulate and harden, thus giving rise to more discomfort, to acute inflammation, or even to perforation. By making an end-to-side anastomosis, implanting the end of the ileum into the side of the sigmoid or upper end of the rectum, all this trouble can be avoided.

There is a certain amount of danger from the backing up of the feces in the proximal end of the sigmoid. This can be avoided by passing the distal end of the ileum through a buttonhole opposite McBurney's point, through which the colon can be irrigated. In this case the obstruction at the splenic flexure of the colon would make this step impossible, and the question arises whether it would be wiser to cut off the ileum and pass it through the abdominal wall for the purpose of irrigating the ascending and transverse colon or whether the plan we have followed is better. The plan we have followed has the advantage of being a little more simple, and in case the growth proves to be due to actinomysosis, as we have assumed, upon its disappearance it will be possible to re-establish the normal intestinal route very easily. On the other hand, if this anastomosis should not functionate satisfactorily, it will always be an easy matter to cut off the ileum above the anastomosis, attach the proximal end to the colon, and pass the distal end through the abdominal wall. That can be done at any time.

Now I am fastening the sigmoid and the ileum to the pelvic peritoneum just above the point of anastomosis in order to make it impossible for any portion of the small intestine to slip through the mesentery and become strangulated. It does not seem that the immobilization caused by this step can cause any great amount of trouble, and the security that it gives the patient against strangulation seems to be well worth while. Now we will bring down the omentum and close the abdominal wall. The patient will be given intensive x-ray treatments, because this treatment can be expected to improve the condition in case the tumor is malignant, and to aid very materially in the cure of the patient if the tumor is due to actinomycosis.

We have found in the case of actinomycosis or blastomycosis that the following treatment is indicated: We give these patients 90 grains of potassium iodid in $\frac{1}{2}$ pint of milk at 6 o'clock in the morning, at 2 o'clock in the afternoon, and 10 o'clock at night; that is, three doses eight hours apart, usually giving 90 grains, and never less than 60 under any condition, because we have found that less than 60 grains seems to have no effect. We continue this dosage for four days. Then we stop for a week and then repeat for four days. This we continue for three or four periods, depending upon the location of the trouble. If there is an accumulation of pus, as in pyemia, for instance, where it is impossible for the potassium iodid to reach the infected tissue, we evacuate the pus if we can. If we cannot, we continue the treatment for three or four periods once a month until all the pus has been absorbed, because otherwise some of the infecting organism may remain at a point where they cannot be reached by the potassium iodid in the circulation, and if the treatment is discontinued before all the organisms are killed, they will re-infect the tissues and the trouble will begin all over again.

A week ago today we operated upon a veterinary surgeon who has a large practice in Wisconsin, and we discussed this question with him. He told us that he has been very successful in treating actinomycosis in cattle by the following method: 120 grains of potassium iodid are given in an abundance of water morning and evening. This dose is repeated daily until the animal, by the looks of its eyes and discharge from its nose, shows that it is full of iodin. Then it is stopped for a week, to be repeated the following week. This is done for several weeks and the result is a complete cure.

I remember forty years ago when there was an old farmer up in Wisconsin who used to cure lumpy jaw. For many miles around his farm he got the name of being able to cure lumpy jaw. He used the following plan: He placed the animal in a box-stall in which was a pail of water containing 2 ounces of the iodid of potash and allowed the animal nothing else to drink until the water was all gone. Then it was given another pail of water. He would repeat this dose at weekly intervals for a period of several weeks and regularly cured those cases of lumpy jaw. Taking what our veterinarian told me yesterday with what the old veterinarian did forty years ago, it seems that the old veterinarian iodized the patient with the first dose. This veterinarian today gives the cattle probably the same amount in doses of 2 drams, but I was surprised to find that he was successful with 2 drams, since it is not much more than we give a man. However, it is quite possible that the quantity passing through the circulation will do the work. He also gives it for several days to a week. We give it for four days. The important point is that you must not give it continuously. We had one case in which we gave it right along for six weeks and then stopped, but in two or three weeks the disease started up again. In other words, certain of the organisms, possibly the spores, although opinion is divided as to whether actinomyces produce spores or not, are left dormant by the presence of the iodin. As long as the iodin is there, the spores cannot develop. We have had some very striking examples to illustrate this point.

One patient came in with actinomycosis of the lower jaw, which had gone into the neck and down into the larynx. We treated him with potassium iodid, and in six weeks he was apparently well. A year later he came in with edema of the glottis. He had been well during the meantime. We thought we had to deal with a case of actinomycosis of the larynx. He was nearly dead when he came in, and had traveled a distance of five hundred miles after he started to choke. We gave him this remedy again and did various things to enable him to breathe for a few days until the remedy had its effect, and he again recovered. Then we gave him the remedy once a month for six months. It is ten or twelve years now and he has been perfectly well ever since.

We had another case, an equally interesting one, in which there was actinomycosis of the colon and liver, with an associated empyema. We treated him in the same way and he got apparently well. After he was apparently well we lost sight of him. He went to another physician who treated him until he died. At the autopsy there was found a healed scar in the colon and in the liver, and an abscess in the chest from which his final actinomycosis had developed. Now, if we had known of the abscess we would have given him this treatment once a month for five or six years, always in time to kill off the mature or active organisms that had developed from the spores or latent actinomyces contained in this abscess, if we had been unable to cure the abscess which we had overlooked by surgical means. If we had been successful in the surgical treatment of this abscess we would have given the patient potassium iodid and he would undoubtedly have gotten well.

One thing which our veterinary friend told us was that whenever there is a hoof nail or a rough tooth or any point that may become infected or cause a wound, it must be removed, because it may furnish a nidus through which re-infection may occur. If there are pieces of dead bone in the jaw in these cases he takes them out.

For many years we have been in the habit of removing infected teeth, tonsils, and all other easily accessible sources of infection in cases of actinomycosis because of the well-known fact that actinomycosis is fundamentally a local disease, spreading through the tissues by direct extension and originating, as a rule, in tissues which are already diseased, such as carious teeth, or, in intestinal and abdominal actinomycosis, where there is marked stagnation of the fecal current such as is frequently the case in the large intestine. Actinomyces growing in the cavity of a carious tooth may supply a constant stream of fungus colonies which, swallowed with the food and secretions of the mouth, may search out a point of lowered resistance in the intestine—possibly the lodging place of a fecolith in one of the haustra—and produce the very serious picture of abdominal actinomycosis such as you see today.

There is one other point I might mention: You remember the extensive lymphatic involvement which this case presented. In all probability that represented the effects of secondary infection, since the actinomyces notoriously avoid lymphatics and but rarely travel by the blood-stream. Hence we find, as I have already indicated, the infection almost universally spreads by direct extension, by continuity, and contiguity of tissues. Distant metastases are not likely to occur, so that generalized actinomycosis, unlike generalized blastomycosis or tuberculosis, is a very rare disease. We also find that abdominal actinomycosis is frequently secondary to oral actinomycosis; that laryngeal actinomycosis and actinomycosis of the neck are likewise frequently secondary to oral actinomycosis, and that pulmonary actinomycosis may be secondary to oral actinomycosis or to abdominal actinomycosis by extension through the diaphragm.

Note.—The patient was given treatment as outlined above, beginning the day after the operation. Two days later the tumor was less adherent to the abdominal wall, much less tender, and it was markedly smaller. When he left the hospital on the twentieth day the tumor was about half as large as at the time of admission and his general condition was greatly improved.

CARCINOMA OF THE RECTUM—EXCISION—TRANSPLANTATION OF SIGMOID INTO PERINEUM—TECHNIC OF OPERATION

Summary: Passage of blood and mucus per rectum with some associated tenesmus for six weeks the only symptoms of a large carcinoma of the rectum; removal of tumor by the combined abdominal-perineal route; inguinal colostomy, without opening bowel, as a precautionary measure; the perineal anus; patient should be made to lie on one side or the other for the first few days after operation.

History.—The patient, a married woman of fifty-three years, was admitted to the hospital September 16, 1916, because of a carcinoma of the rectum.

Her mother died at the age of fifty of brain tumor. One uncle died of tuberculosis. There is no history of carcinoma in the family. The patient had spinal meningitis at the age of twelve, following which she was deaf for one year. Her thyroid gland was removed in February, 1915. She had the menopause at the age of forty-five. She has been married thirty-one years and has had nine children, five of whom are living. Her habits are good. Before the goiter operation she had diarrhea and incontinence of feces. She has no trouble with urination.

Present Complaint.—Six weeks ago she began to notice a small amount of blood at times in the stool. She had no pain. Two or three weeks later she noticed blood and mucus and some tenesmus. These symptoms have grown worse. Last Monday she went to a hospital, where she remained for three days. While there she took salts and oil on several days in succession with little result. She has no pain and has lost no weight that she knows of.

Physical Examination.—The patient is a well-developed and well-nourished adult with a clear skin. The throat is negative. The upper teeth are missing. There is a collar incision over the anterior and lower part of the neck which is well healed. Heart, lungs, and breasts are negative. The abdomen is very flaccid, rounded, striated, and slightly pigmented. There is no tender-

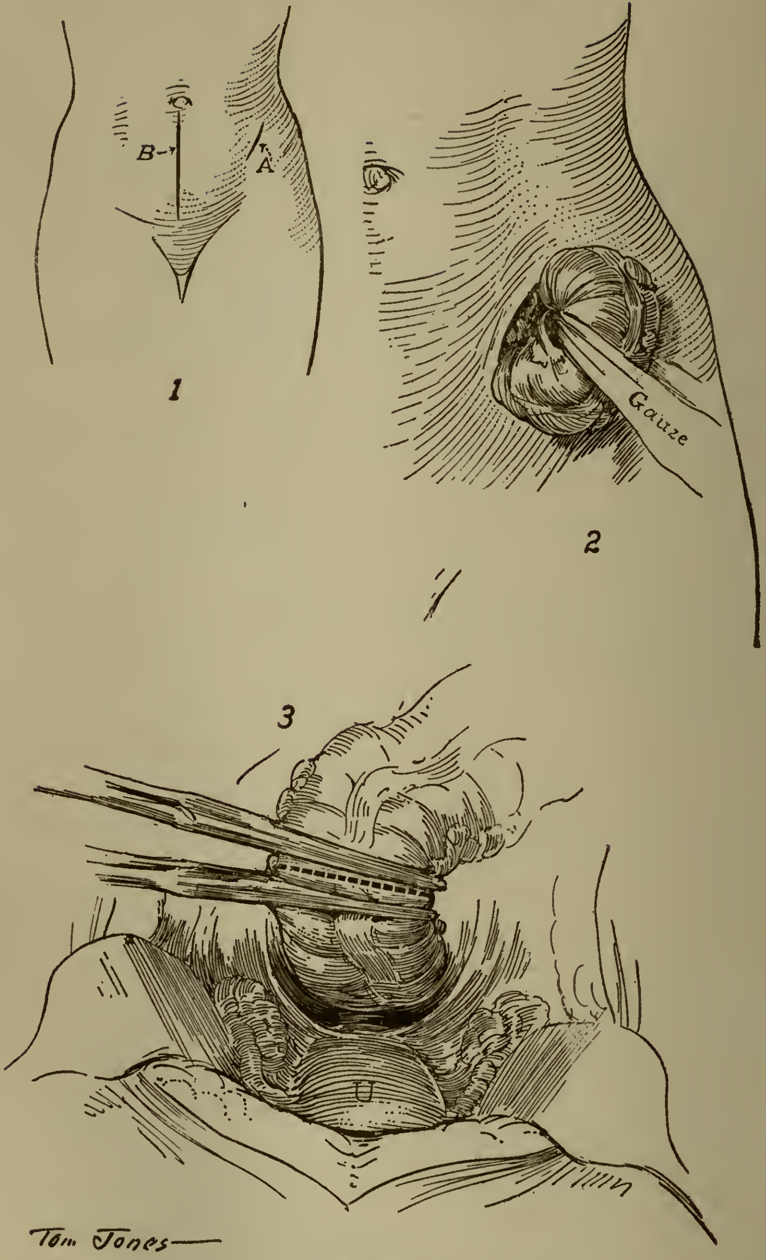

Fig. 461.

ness. The uterus is small and retroverted and the cervix is lacerated bilaterally. Slight cystocele and rectocele are present. Examination by the rectum shows that, beginning at a point 4 cm. from the internal sphincter, is a ring-like, moderately hard, easily movable cauliflower mass encircling the lumen of the rectum. The lumen admits the tip of one finger. No glands are palpable.

Comments.—DR. OCHSNER (September 18, 1916): This patient has a carcinoma of the rectum. The carcinoma is located so high that it is not possible to remove it from below with any degree of satisfaction. I have, consequently, made a median abdominal incision (Fig. 461, 1). Upon examining the liver I find that it contains no secondary growths. Examining the colon I find a very long sigmoid flexure. This is very favorable for our purposes, as it will enable us to make the excision and bring the colon down to the perineum without tension and without endangering its blood-supply. I am trying to locate a point at which it will be possible for me to do a colostomy without interfering with this long sigmoid flexure. I wish to do a preliminary colostomy in order to protect the portion of bowel which is to be brought down into the perineum from the accumulation and passage of irritating gas and fecal masses until healing is complete.

Here I find a piece of the colon at the junction of the descending colon and sigmoid which I can pass through the opening I have made in the left inguinal region. I make this opening by cutting the skin and superficial fascia and then splitting the aponeurosis of the external oblique muscle in the direction of its fibers from without downward and inward. In this patient the internal oblique muscle is exceptionally weak, so that there are just a very few fibers present, but here again I split in the direction of the fibers in order not to cut any of the muscle. I then bring up the lower end of the descending colon, pass it through

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Fig. 461.—Operation for excision of the rectum for carcinoma. 1. *A*, Colostomy incision; *B*, median abdominal incision. 2. A loop of the descending colon has been brought out through the colostomy opening and is kept there by a strip of gauze which passes through the mesenteric attachment. 3. The rectum has been grasped by two heavy clamps and is about to be severed between the clamps along the dotted line.

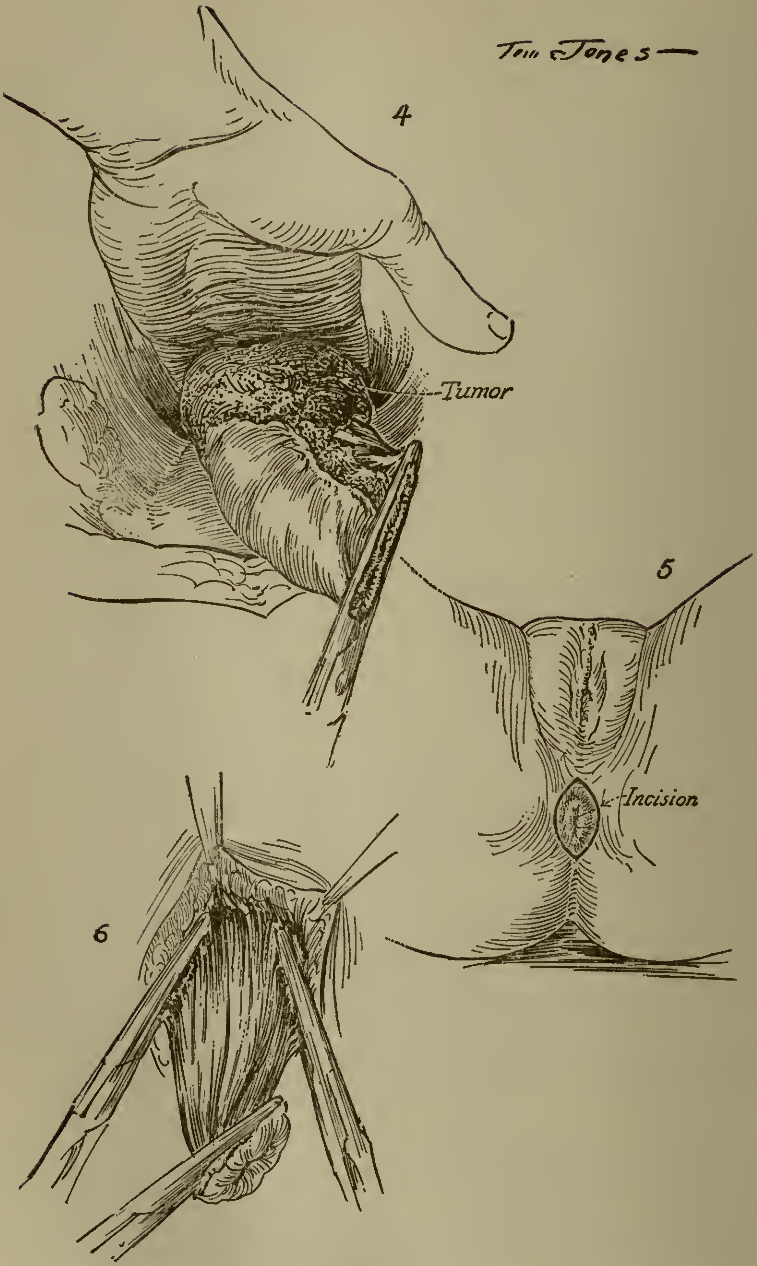

Fig. 462.

the wound, and secure it temporarily by means of a strip of gauze with which I encircle the bowel, perforating the mesocolon at its junction with the intestine (Fig. 461, 2).

We bank away all the intestine by means of gauze pads. This leaves exposed only the pelvic structures, so that every step of the operation will be in plain view. Now I locate the tumor which is in the lower rectum. I find that there is no involvement of the intestine above the brim of the pelvis. I place a suture temporarily in the fundus of the uterus in order to retract it, so as to leave the entire field exposed. Now I grasp the colon 5 cm. above the uppermost portion of the growth between heavy clamps and sever the intestine at this point (Fig. 461, 3).

Now we are unfolding the lower segment step by step, severing the peritoneum and removing all the pelvic fat as we go along (Fig. 462, 4). In our progress I find that everything is loose and there are no adhesions, which means that probably this entire tumor is located within the rectum. There is absolutely no need in hurrying because a few minutes of time is not of the slightest importance here. You see how well these tissues can be retracted by means of the long retractors, so that everything is in perfect view. Now we have this lower segment loosened throughout its entire length and are prepared to turn our attention to the rectum. You can easily see that one of the most important parts of the whole procedure is in the hands of an assistant who is holding the upper segment of bowel. Our success depends on his care in handling that proposition. We have taken every precaution to get the bowel empty, starting three days ago, and still it is not quite clean, and if our assistant allows that segment to slip this patient's life will probably be terminated by a general peritonitis.

We shall now place the patient in the lithotomy position in order to work on the perineum. With the patient in the lithotomy position I place my incision around the anus (Fig. 462, 5)

Fig. 462.—4. Rectum, together with the tumor and the perirectal fat and lymphatics, freed by blunt dissection. 5. Perineal incision. 6. Dissection of lower rectum from perineal tissues. A forceps closes the lumen of the anus. The levator ani muscle is shown at each side in the bite of the forceps.

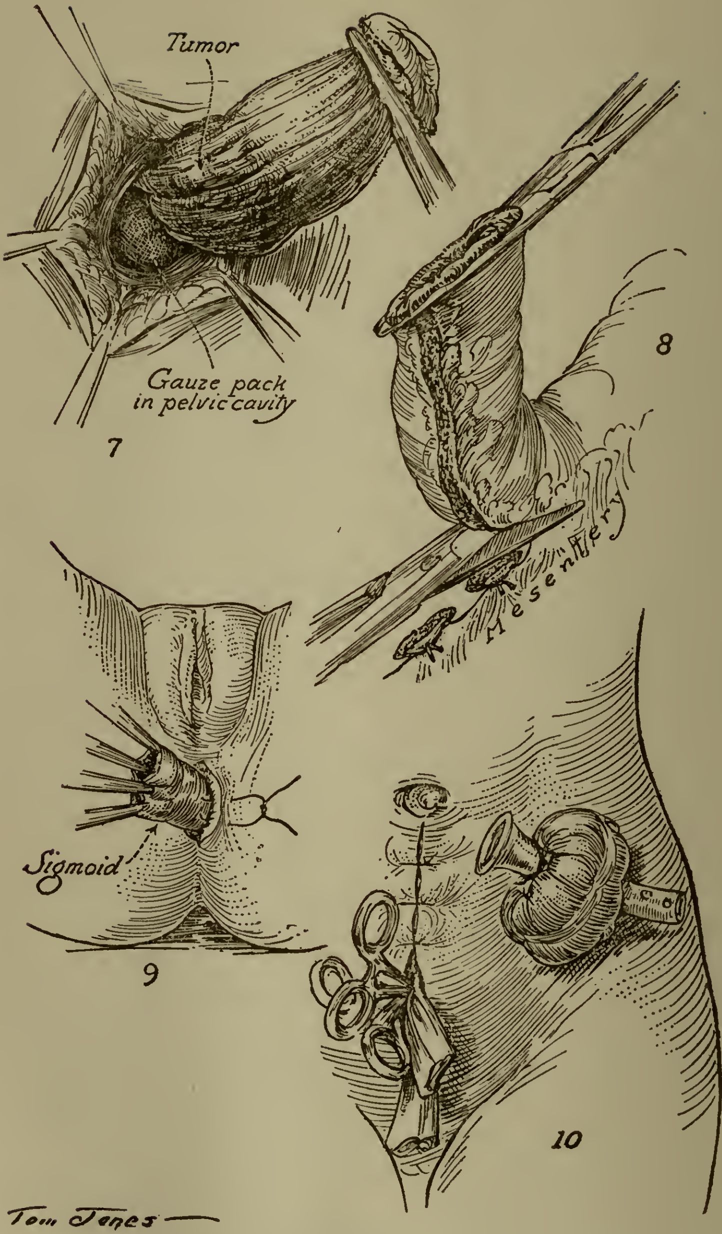
Tumor
Gauze pack in pelvic cavity
7
8
Mesentery
Sigmoid
9
10
Tom Jones

Fig. 463.

and dissect back the lower end of the rectum. Now I apply a pair of forceps to the levator ani muscle on each side (Fig. 462, 6), sever it, and grasp all the bleeding points with artery forceps. The rectovaginal septum in this case is exceptionally thin, so that I have to use the very greatest care to avoid cutting the vagina. The total loss of blood amounts to nothing because we grasp every vessel before we cut it. I have entered the peritoneal cavity posteriorly and I am dissecting with my finger all the tissues, so that with the rectum I will remove every bit of the pelvic fat, but so far I have not encountered the least particle of tissue outside of the rectum that feels suspicious of tumor growth. In order to obtain space I pack the entire pelvis with gauze (Fig. 463, 7) and ligate all the vessels controlled by forceps, so as to have an entirely free field. In addition, we thus clinch our control of hemorrhage by ligation of all the larger vessels, while the pressure of the gauze which we have packed into the pelvis overcomes any oozing from capillaries or small veins. There are two very important factors in this operation that must never be lost sight of which are technical in character, namely, the elements of unnecessary traumatism and loss of blood. It is a relatively easy matter to avoid both of these if one's attention is constantly given to them.

Now I remove the pads that I have applied and find everything dry. I have succeeded in loosening this entire mass and I now remove it in one piece. We must next turn our attention to the reconstruction of the rectum. This we will endeavor to do by implanting the end of the sigmoid in the perineal wound. You see I have the end of the sigmoid flexure at my command. By cutting the mesosigmoid for a short distance (Fig. 463, 8) with

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Fig. 463.—7. The entire rectum dissected free just before removal through the perineal incision. The gauze pack used to control hemorrhage from raw surfaces is visible in the depths of the wound. 8. Sigmoid being loosened from its attachment in order to lengthen the free segment. 9. Sigmoid projecting through the perineal wound and the first silk suture applied. The cigarette drains are not shown. 10. The abdominal wound closed with drainage from pelvis. The two forceps have been applied to bleeding vessels along sacrum and are to be removed in thirty-six hours. A glass tube has been used to replace the piece of gauze supporting loop of descending colon in the colostomy opening.

due regard for the blood-supply of the adjacent segment of bowel, we are able to mobilize the sigmoid sufficiently to allow me to bring the cut end through the perineal opening. I place a cigarette drain on each side of the pelvis and then pass forceps up from the lower wound and bring the sigmoid down, suturing the stump exactly in the middle of the perineum (Fig. 463, 9). We had a visit from Professor Grasse, of Halle, some years ago while we were doing an operation of this type. Before that we had always fastened the lower stump to the posterior end of the perineal wound, believing we would get better control of the bowels in that way, but on his suggestion we changed to this plan we are using today, and have found it much more satisfactory. We place a few silk sutures in the sigmoid so as to take tension off this lower segment, although we have loosened it sufficiently to prevent any tension to speak of, and then suture the end of the sigmoid so that it projects about 2 cm. beyond the level of the skin.

The one precaution which we should take after this operation, and I think it is very important, is to prevent these patients from lying on their backs, because that is likely to cause an accumulation of fluid in the pelvis. We elevate the head of the bed so that all the drainage will be downward and we have the patient lie on one side or the other all the time. The last step of the operation is the substitution of a glass tube for the gauze with which we anchored the colon in our colostomy incision (Fig. 463, 10). The colostomy will be opened in forty-eight hours if necessary and will protect the operative field from contamination until healing is complete.

CLINIC OF DR. CARL B. DAVIS

PRESBYTERIAN HOSPITAL

CANCER OF THE RECTUM

Summary: Indications governing the choice of operation in the surgical treatment of cancer of the rectum and suggestions as to the technic involved; the Ball operation; dangers of end-to-end anastomosis; necessity of opening abdomen in order to determine operability; contraindications for operation; the combined operation and the abdominal anus; diagnosis easy if patients are examined—frequent confusion with simple hemorrhoids.

FOR a malignant growth at any given place in the rectal canal the operative treatment is not constant. The indications vary with the extent of the tumor, what neighboring or distant structures are involved, and with the age, sex, and condition of the patient.

Malignant disease of the anal canal is best treated by total extirpation of the anus, sphincters, and inguinal lymph-glands, and terminating the gut with a sacral or abdominal anus. If the disease is limited to the anal epithelium it is not necessary to remove the ampulla or glands behind the ampulla, as the lymphatic drainage of the anal canal is downward, across the perineum, and into the inguinal lymph-glands.

Carcinoma of the ampulla when present as a small adenomatous mass early in its development is sometimes treated by the cautery. Ball has devised a method to save the nerve-supply to the anal muscle intact where the lower portion of the ampulla is resected and the gut brought down through the sphincters in an effort to preserve function. Through incisions in the perineum and in the rectococcygeal space a ligature is carried around the bowel above the level of the anal canal (Fig. 464). This ligature is used to hold the fecal contents in place when the bowel is cut off. The sphincters are incised anteriorly and posteriorly and the anal segments with their nerve-supply intact turned aside (Fig. 465). The ampulla is resected, pulled down, and attached to the anal sphincters, which are united at the anterior and posterior planes of section. The anal epithelium is removed to permit of adhesion between the rectal wall and the sphincters (Fig. 466).

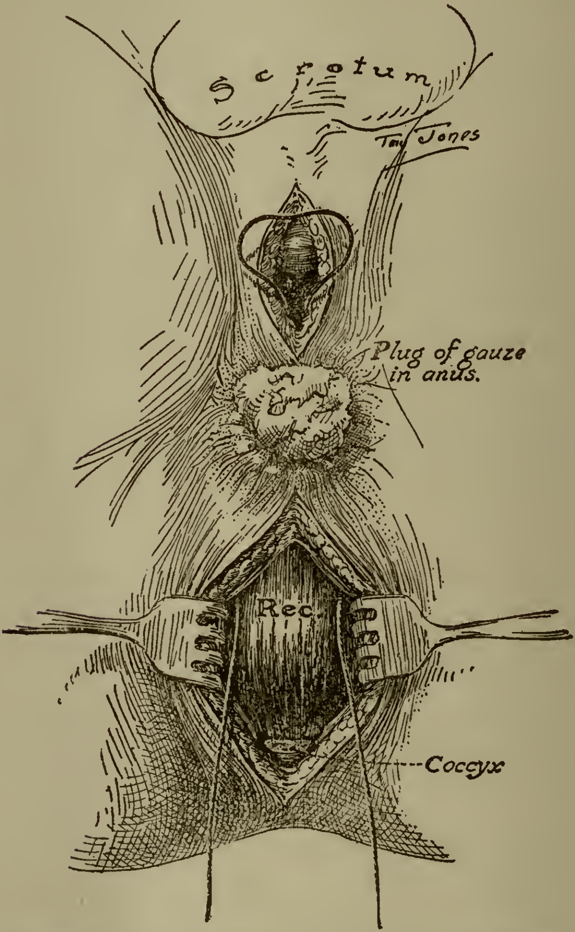


Fig. 464.—Technic of Ball for resection of the lower ampulla.

Carcinoma low in the ampulla, where at all extensive, is best treated by total extirpation of the entire ampulla with its blood-vessels and lymphatics. The termination of the procedure is a matter of debate at present. In some instances it has been possible to bring the gut down from the pelvis and draw it through the sphincters and preserve anal function. Where this method is employed the operator is prone to leave too much gut or too much of the lymphatic system, either of which may contain malignant disease. A more thorough prodecure is to terminate the bowel as a sacral or abdominal anus. Where the growth is at the upper limits of the rectum just at the pouch of Douglas,

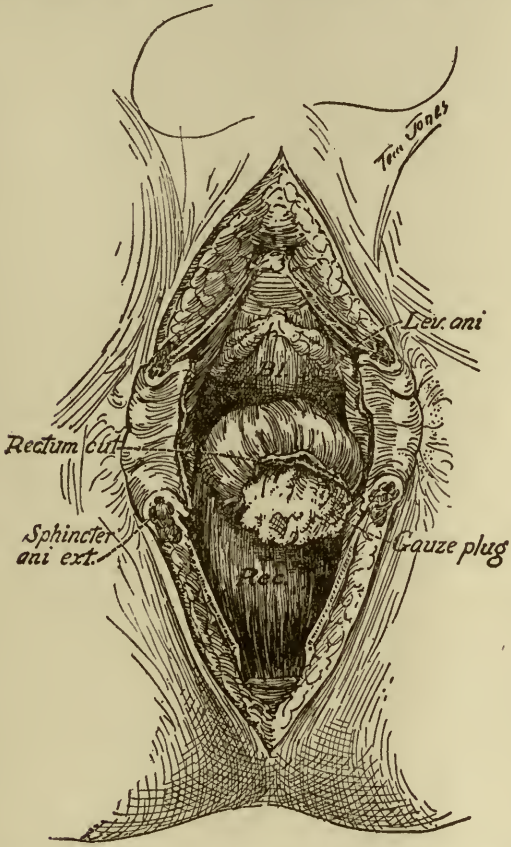


Fig. 465.—Technic of Ball. Sphincters incised anteriorly, posteriorly, and severed from the ampulla of the rectum.

it is possible to mobilize the rectum in its upper limits through an abdominal incision and to resect the gut below the level of the growth, and then to do a complete extirpation of glands, fat, and gut well above the level of the growth. Where this is done it is safer to leave the superior hemorrhoidal artery, as sloughing will occur in some cases where this source of blood-supply is cut off. The distal end of the gut is turned in and the remaining rectum left as a blind pouch. Complete removal of the gut and glands below the level of the tumor is not necessary, as the lymphatic drainage of the rectum is upward toward the aortic glands.

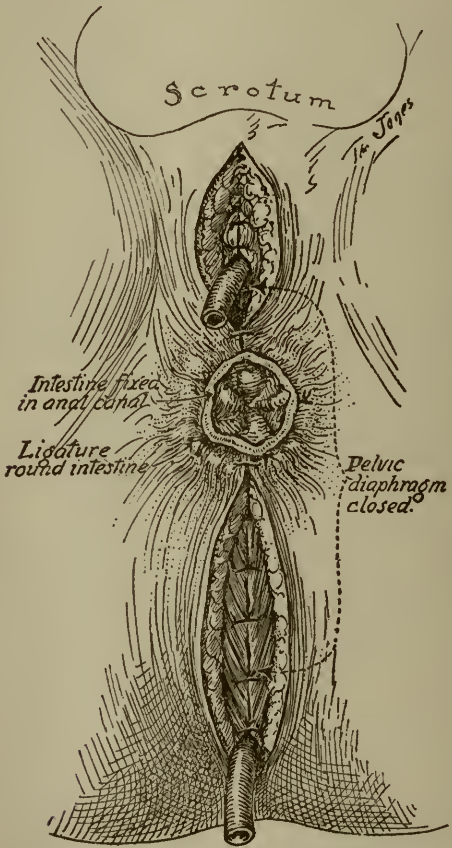


Fig. 466.—Technic of Ball. The gut pulled down. Sphincters repaired anteriorly and posteriorly.

The junction of the anal canal of flat epithelial cells and the cylindric cell layer of the ampulla is a sort of lymphatic watershed, with the lymphatic flow of the anus passing downward toward the inguinal glands, and the lymphatic drainage of the cylindric cells of the ampulla passing upward toward the aortic glands (Fig. 467). This is due, of course, to the fact that the two structures originate from different embryologic sources. The anal plate, or proctodeum, comes from an infolding of the ectoderm. Hence the drainage is the same as that of the skin of the anal region. The ampulla of the rectum is the lowermost portion of the hind gut which gives rise to the lower intestinal tract. By leaving this blind pouch the patient is spared the

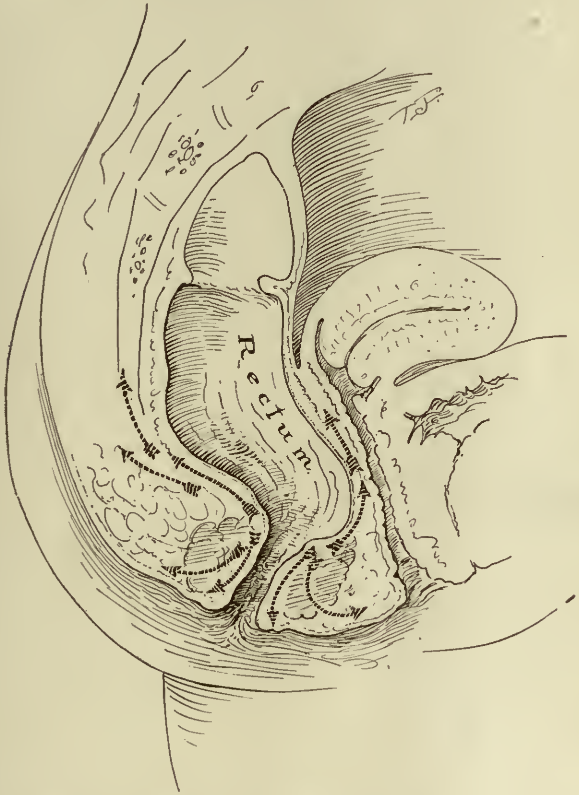


Fig. 467.—Directions of lymphatic drainage in the ampulla and in the anal canal.

shock and increased mortality of a complete extirpation of the entire lower gut, and the ultimate prognosis is just as good. The bowel in this procedure is terminated on the abdomen (Fig. 468).

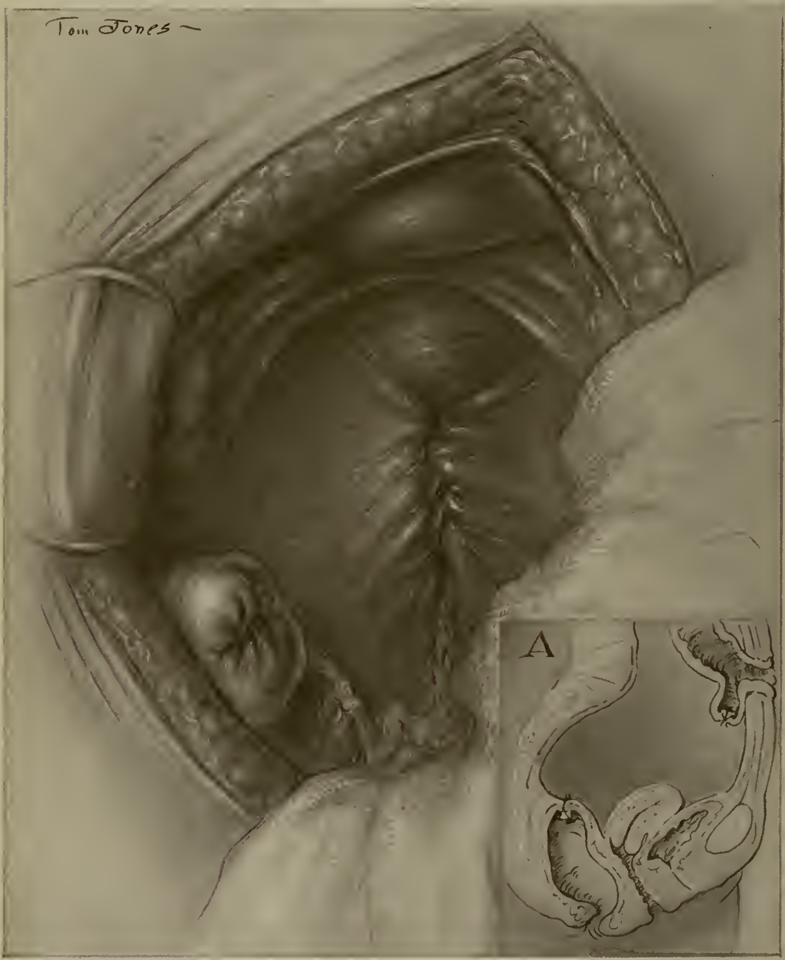


Fig. 468.—This patient was operated in an emergency with obstruction of the bowel. A loop of the intestine was pulled through the abdomen and a colostomy established. At a second stage the tumor, which was in the rectosigmoidal junction, was removed and the rectum turned in as a blind pouch.

Tumors of the rectosigmoidal junction are approached with two points of view. We may attempt removal of the growth with end-to-end repair of the gut, or removal of the growth and termination of the bowel on the abdomen. End-to-end anastomosis by suture of the larger bowel, even where both ends are covered with peritoneum, carries a high mortality. End-to-end anastomosis of the large bowel at the rectosigmoidal juncture by suture carries a somewhat larger risk, as the distal end does not have a peritoneal coat. Where the patient is not lost, there develops frequently a fecal fistula which is most difficult to close. In a number of cases reinforcement of the line of invagination or suture by portions of detached omentum has given good results in our hands. Baldwin has devised an apparatus consisting of a Murphy button attached to a metal tube for use in anastomosis of this region. This has been used with success by a number of surgeons.

In all cases of cancer of the rectum it seems well to open the abdomen to determine if the case is operable. Many times it has been shown that a case apparently favorable for operation has already developed metastases in the liver. At times these metastases are not larger than a pea. Other cases will show tumors of considerable size in the body of the liver, high up in the lobe, but not palpable beneath the costal arch. Malignant involvement of the glands in the mesorectum is not a contraindication for operation. Most of the enlarged glands found in the mesorectum prove to be inflammatory when examined under the microscope. Cancer of the rectum is slow to involve the lymphatic system to any great extent early in the disease. Involvement of the bladder is not an absolute contraindication if the mucosa is not involved. Cystoscopic examination will determine this, of course.

The ureters have been involved where the tumor passes through the gut wall at the level where the ureters pass close to the rectum on their way to the bladder (Fig. 469). Involvement of the prostate, as a rule, is a contraindication. Involvement of the uterus and vaginal wall is not a contraindication for removal. Malignant involvement of the sacrum is a contraindication. Adhesion of the ileum to the growth at the rectosigmoidal junction is seen. This, when inflammatory, is not a contraindication. If the disease has penetrated the ileum, resection of the small gut and glands in the mesentery would be necessary. This should be attempted only when the patient has an unusual vitality.

Operability is a factor which varies with the judgment of the individual surgeon. If the operator is inclined to do the greater number of his cases by some form of Kraske or posterior route, he will find a much smaller number of cases adapted for operation than he who uses the combined abdominal perineal route. Again, with increasing experience, the range of operability increases. This is well shown in the work of the Rochester Clinic. In the first 619 cases they had an operability of 53 per cent. In the last 277 cases they found 72 per cent. were operable.

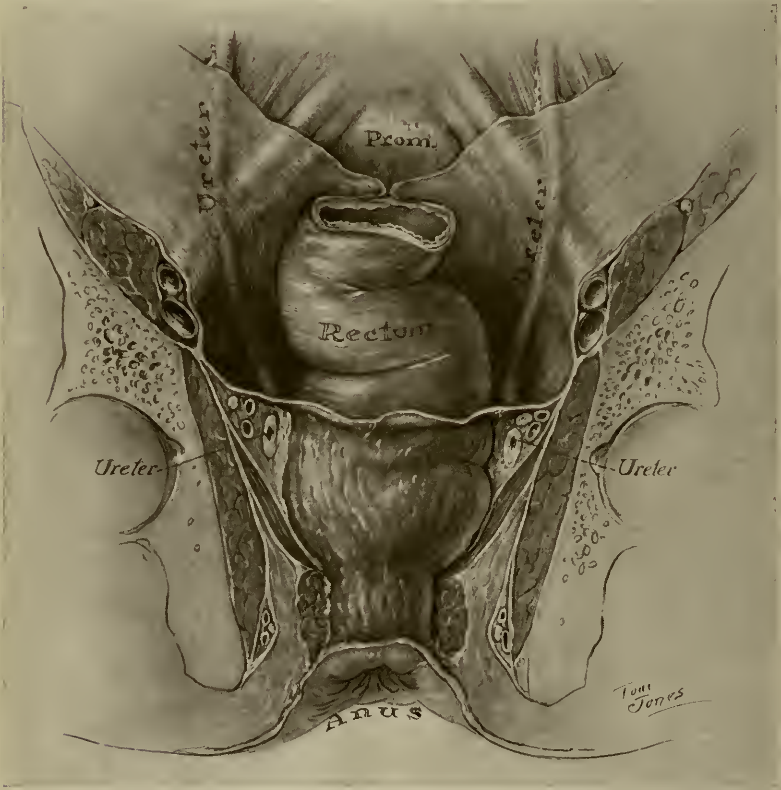


Fig. 469.—Relation of the ureters and rectum.

Operative mortality has been an extremely variable factor. Cases not operable by the Kraske route have been attempted by the combined route, and when lost, the more complete procedure has been given a bad reputation undeservedly. Again, with any given procedure the operator is inclined to extend his limits with an increasing experience. With a more aggressive treatment we are bound to increase the mortality, but, as Mayo has pointed out, we are constantly saving more patients out of a given number.

The ultimate mortality is a most valuable indicator. While the immediate mortality has been lower following the Kraske operation, the final condition of the patient shows a recurrence in a far larger number when operated by the Kraske when compared with the combined operation. Hartman, of Paris, in a compilation of cases from the French, British, German, and American literature, finds a mortality of 37 per cent. for the combined cases and a mortality of 15 per cent. for the posterior operation. The recurrences in the combined route were 18 per cent., while the recurrences in the posterior operation were 68 per cent. Thus, 37 per cent. mortality plus 18 per cent. recurrence gives 55 per cent. dying from cancer when treated by the combined technic, against 15 per cent. immediate mortality plus 68 per cent. recurrence, or 83 per cent. dying from cancer when operated by a posterior operation.

Function following operation is an important element to the patient. Preservation of sphincter control is ideal, but can be obtained only in low-lying cases or rectosigmoidal cases, as a rule. When the decision is left to the patient there is usually a demand that if a normal anus is impossible then a termination of the bowel be obtained as near the normal site as possible. The suggestion of an abdominal anus is repugnant, not only to the patient, but to many medical men as well. This decision should not be left entirely to the impression of the patient. A properly constructed abdominal anus is not to be compared with the colostomy obtained by pulling the sigmoid loop through the flank and later incising the gut. The advantages of the abdominal anus are that it is capable of greater control. It is cleaner and it is more easily cared for by the patient. The patient can determine the condition of affairs by sight rather than by touch. A good abdominal anus is obtained by bringing up the end of the resected sigmoid out of the pelvis, carrying it through the peritoneum and muscles, and then upward again beneath the skin for a distance of 2 inches, as shown in Fig. 470. In this procedure the dependent loop formed in the sigmoid acts as a reservoir and there is no frequent loss of stools. With a flushing each twenty-four hours there is perfect control in many cases. Again, the bowel lying beneath the skin is readily compressed by external pressure, thus controlling the escape of gas. With this type of anus there is no need

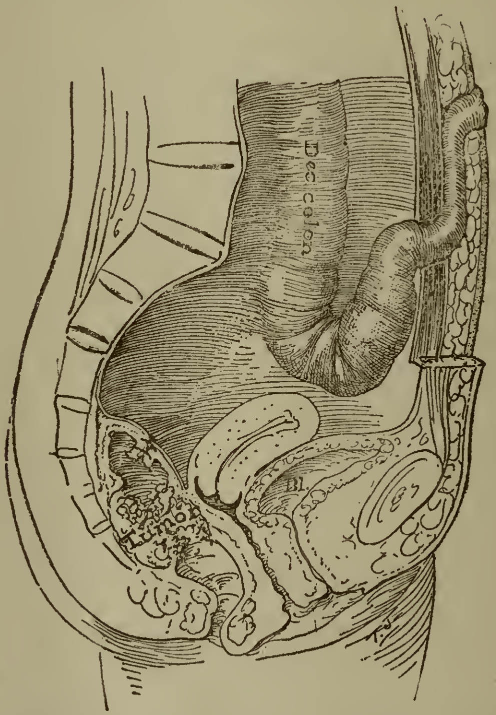


Fig. 470.—Diagrammatic representation of the construction of an abdominal anus. This represents the work done, as a rule, in the first stage. The lower portion of the rectum and the tumor mass is removed at a second stage by an extraperitoneal operation through a sacral incision.

of the cumbersome foul-smelling rubber bags to catch escaping feces. A metal cup fitted with a pneumatic ring and supported on a belt makes a light simple apparatus that is inexpensive and is readily cleansed. The pneumatic ring pressing on the gut as it extends beneath the skin is of value in controlling the escape of gas and the occasional fecal mass (Fig. 471).

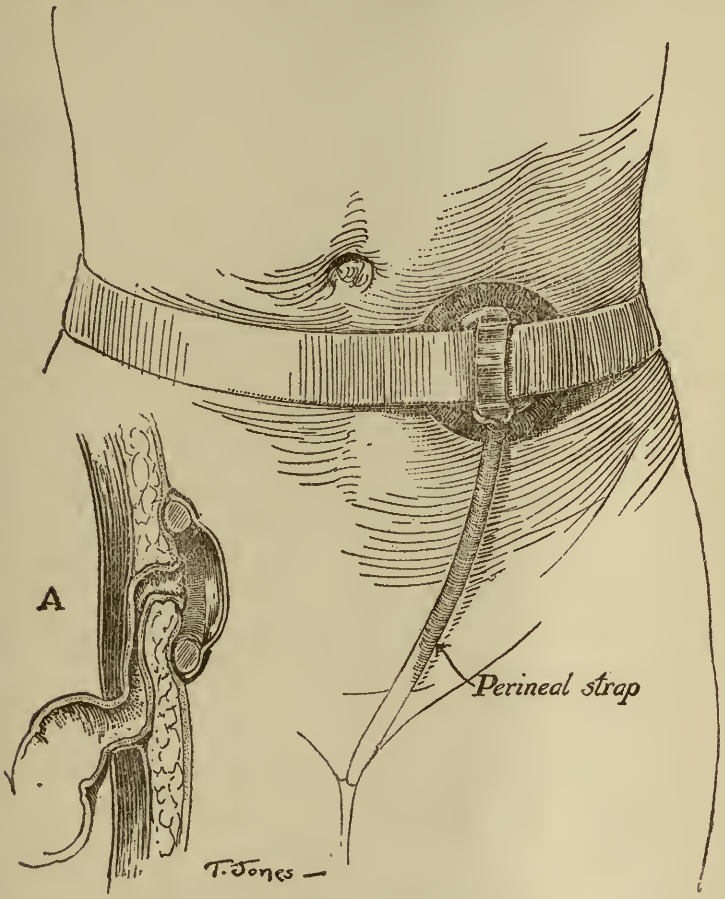


Fig. 471.—A simple and efficient colostomy cup.

Diagnosis is not difficult if the patients are examined. In many cases the physician has been satisfied by a visual verification of hemorrhoids after the patient has reported for blood in the stools. Hemorrhoids are a secondary development found in numerous cases of malignant disease of the rectum. A proctoscopic or even a digital examination in most cases will establish the diagnosis with ease. A section removed for microscopic examination will settle the diagnosis. There is no other condition of the rectum which gives the same sensation to the examining finger as that given by the usual ulcer in the growth surrounded by the indurated edges. No case of blood in the stools should be operated for hemorrhoids until the physician has satisfied himself that cancer is not present.

About one-third of all the cases of rectal cancer operated in the Presbyterian Hospital of Chicago during the last ten years have had an operation for hemorrhoids within a few months previous to their entrance with malignant disease finally demonstrated.

CLINIC OF DR. ARTHUR DEAN BEVAN

Presbyterian Hospital

CARCINOMA OF RECTUM—TREATMENT BY LOCAL EXCISION

Summary: Detailed technic of local removal; types of cases suitable for this procedure; after-treatment—healing by granulation; results preferable to those following radical removal with inguinal or sacral anus.

This patient is a comparatively young man, being but thirty-seven years of age. He has a small localized carcinoma in the rectum covering an area about 1 or 1¼ inches in diameter, and situated 3 inches above the sphincter on the anterior surface of the rectum. Most of our patients with carcinoma of the rectum are well over forty years of age as a rule. This man has been complaining of some discharge of mucus and blood, and the lesion was discovered by the physician whom he consulted with these symptoms. He was then referred to my service.

I want to take this opportunity of going over pretty fully the operation which we are employing for cases of this kind, and which has given such very excellent results in selected cases as compared with any other method which we have employed.

Now that the patient is etherized I shall have him brought in. You see that I have placed him face downward on the table, which is broken in the middle, so as to raise the pelvis well above the head and lower extremities. I now make an incision about 5 or 6 inches in length from the lower end of the sacrum down to the anus (Fig. 472). I divide the skin and superficial fascia and expose the coccyx above, separate it from its ligamentous attachments and find the line of articulation between the coccyx and the sacrum, and cut this through with a pair of bone-cutting forceps (Fig. 473). Removal of the coccyx in these cases gives one

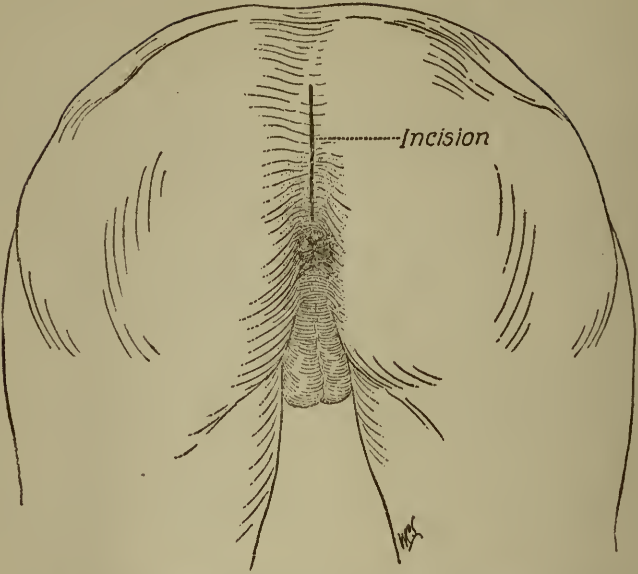


Fig. 472.—Incision extending from last sacral vertebra to anus.

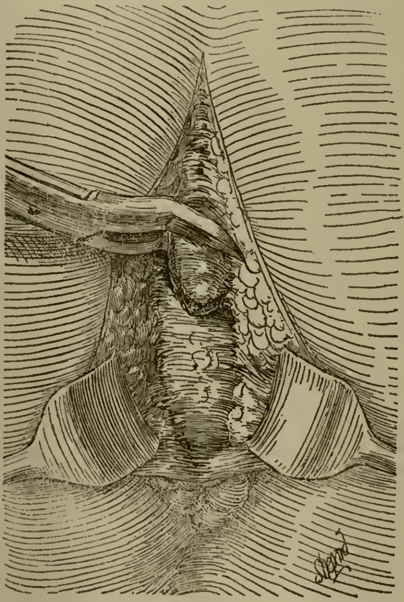


Fig. 473.—Removal of coccyx.

a much freer field for operation, and as it does no permanent harm, I have selected it as routine in these operations. Beginning now at the anus and putting short artery clamps on the entire thickness of the sphincter and rectum, the posterior surface of the rectum is split open for a distance of 3 or 4 inches or more, in this case about 4 inches (Fig. 474). As we divide the rectum posteriorly the carcinoma is very completely and fully brought into view (Fig. 475). The posterior incision which we have made has enabled me to examine the tissues between the rectum and the sacrum, and I find no evidence whatever of glandular enlargements. I regard this case, therefore, as one particularly suited for the operation which we have chosen.

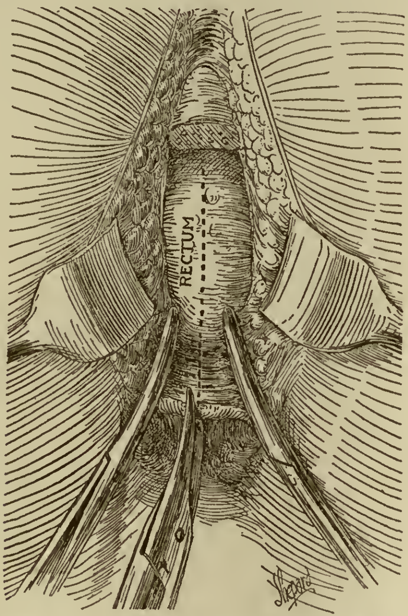


Fig. 474.—Line of incision in posterior wall of rectum—clamps in place to control hemorrhage.

With a Paquelin cautery I cut out the carcinomatous lesion, going well beyond the margin of the growth and dividing all the layers of the rectum, exposing the areolar tissue between the rectum, membranous urethra, and prostate (Fig. 476). With medium-sized catgut and a non-cutting curved needle I sew together the raw surfaces of the wound left by the cautery excision. This is done largely for the purpose of controlling any possible hemorrhage, as well as to approximate, in a general way, the structures at this point (Fig. 477). Beginning now at the upper end of the incision in the rectum I close this completely with sutures and another layer of black linen, with the knots tied inside the caliber of the bowel, and over this a line of sutures of catgut (Fig. 478). The incision in the rectum is completely closed. A piece of iodoform gauze is packed into the rectum and over the area from which the carcinoma has been removed and brought out through the sphincter. Another small gauze drain is put in at the upper angle of the wound and the external incision is closed with silkworm gut and with black linen (Fig. 479).

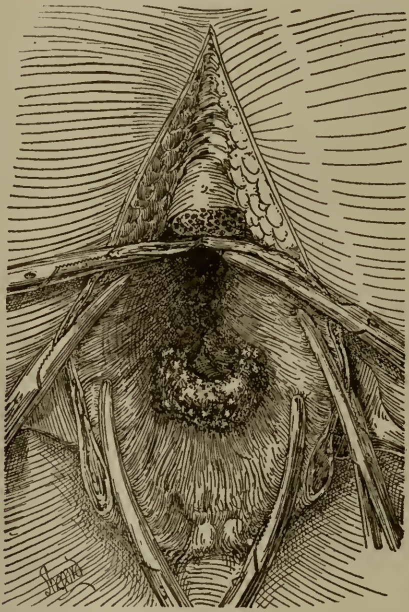


Fig. 475.—Exposure of carcinoma on anterior wall of rectum completed.

I have operated, by this method, on quite a number of cases during the last five or six years, and I believe it is a method that

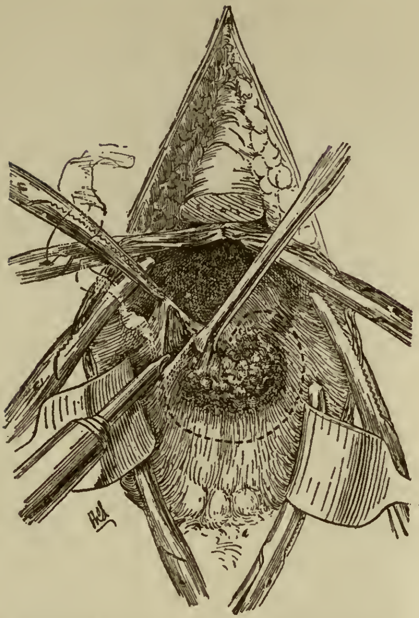


Fig. 476.—Excision of carcinoma with cautery.

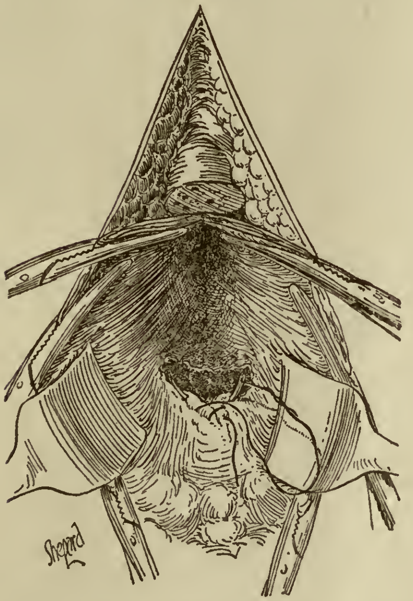


Fig. 477.—Closure of defect after removal of tumor.

should be adopted in beginning small carcinomas of the rectum without any radical involvement. We have employed it in cases where it has been necessary to remove at least one-half of the caliber of the gut. In these cases we have packed the big raw surface from which the carcinoma was removed with iodoform gauze and allowed it to heal by granulation, keeping open a good-sized caliber, and have attained surprisingly good control in patients where at least one-half of the caliber of the sphincter has been removed. Personally, if I had such a condition as the patient upon whom we have just operated, I should like to have this thorough local operation done rather than to have the entire rectum removed, and have either a sacral or an inguinal anus. In this operation we apply practically the same principles of surgery that we apply in doing an operation for the removal of an epithelioma of the lower lip. The prognosis, of course, is not nearly as good as in cancer of the lip. At the same time we have

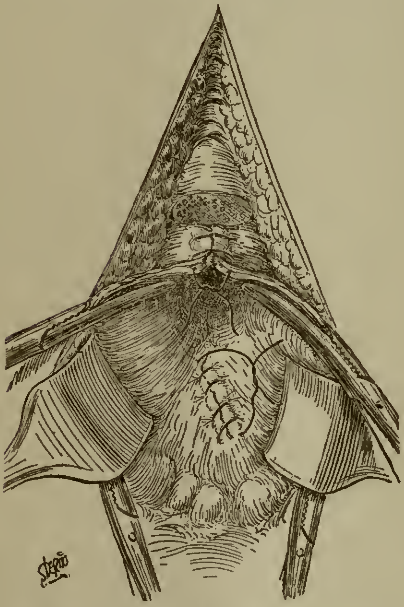


Fig. 478.—Closure of incision in posterior wall of rectum. Knots tied on mucous membrane side of bowel.

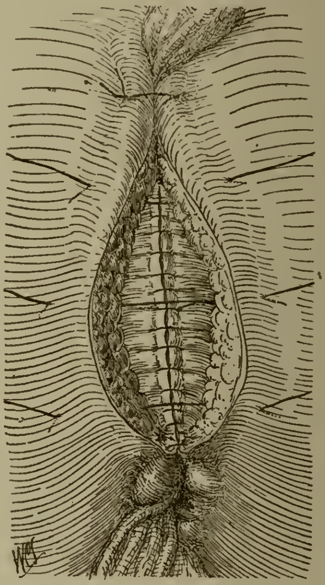


Fig. 479.—Superficial approximation by deep tension sutures. Note gauze drains.

a number of cases alive and well two, three, and four years after these cautery operations in the lower bowel.

The second case I want to show you is a man upon whom I did a somewhat similar operation two weeks ago. He is a man of about seventy-five. I found that in this case I had to remove at least one-half of the sphincter and fully one-half of the rectum for a distance of about 3 inches from the sphincter. This exposed widely the membranous urethra, prostate, and seminal vesicles. It was impossible to close this area with sutures, so I stitched in a large rubber tube about 1¼ inches in diameter and packed the uncovered surfaces of the membranous urethra, prostate, and seminal vesicles with iodoform gauze and left this very large area to granulate.

The patient has made a surprisingly good recovery in spite of his age and the lowered condition of his general health, the result of the carcinoma which had given him great distress for several months. I do not hope to attain anything like complete continence in this case, but I think, on the whole, the man will be made much more comfortable at much less risk by this operation than by any other means we could have employed in his case.

X-RAY BURN OF ANAL REGION

Summary: Patient suffering intolerable pain from a burn following *x*-ray treatments for pruritus ani; treatment by excision of burned area and simple closure of mucous membrane and skin; preliminary colostomy and extensive plastic operation unnecessary.

The next patient upon whom I shall operate this morning is one with a very lamentable and unusual picture. The patient was troubled for a long time with a distressing pruritus ani, and at the advice of a very good medical man he was sent to some *x*-ray experts and the area around the anus subjected to *x*-ray exposures for some time. Unfortunately, he was either unusually susceptible to the action of the *x*-ray or else it was used stronger than was intended, and as a result the skin around the anus was very badly burned for an area of 6 or 7 inches in length and 2½ inches in width. The condition has been most distressing. I do not know that I have ever seen an individual who has had more suffering than this particular patient. Every movement of the body is painful. Having a bowel movement is excruciatingly painful; it is necessary for him to take ½ grain of morphin to control the pain before he can have an evacuation of the bowel.

He has consulted a great many medical men both in this country and abroad. The opinion has been given him frequently that a plastic operation is necessary, and that this, however, should be preceded by a colostomy in order to place the parts at rest during the repair of the plastic. He was sent to me by Dr. Oliver Ormsby, who has had an unusually wide experience in employing the *x*-ray for therapeutic purposes and has seen and treated a large number of *x*-ray burns. He has also treated a good many of these cases of pruritus ani.

After examining the patient the problem seemed to me after all a rather simple one as I analyzed the facts. I could not see the necessity for swinging over any flaps nor any reason for one moment of doing a preliminary colostomy. I have had a large experience with just such cases, as I have shown you this morning,

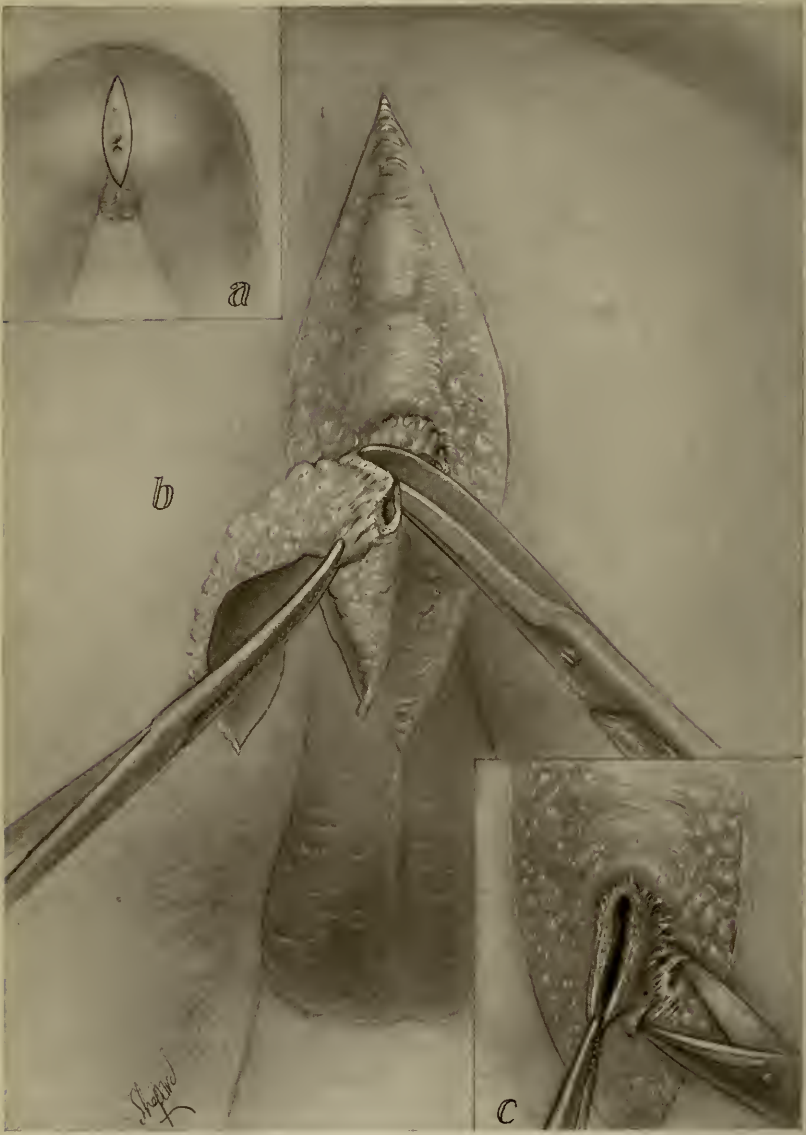


Fig. 480.—*x*-Ray burn of anal region: *a*, *b*, *c*, Steps in the excision of the burned area.

of carcinoma about the anus where repair by granulation tissue has been so surprisingly good, even though it occurred in an infected field, and I determined to do the perfectly simple operation this morning. I shall dissect out widely the area burned by the x-ray, free the mucous membrane of the rectum very much as we do in a Whitehead operation, and bring the lines of the skin incision together with suture, stitching the mucous membrane of the rectum to the skin so as to make a complete closure of the raw area.

Under anesthesia, and with the patient in the same position as the previous cases operated on (lying on the face with the buttocks well elevated), I free the damaged skin through this large longitudinal incision (Fig. 480, *a*). The mucous membrane of the rectum is now dissected up for a distance of $\frac{1}{2}$ to $\frac{3}{4}$ inch and then the entire flap of damaged skin is removed (Fig. 480, *b*). This leaves the uninjured mucous membrane projecting about $\frac{1}{2}$ inch beyond the sphincter (Fig. 480, *c*). The line of incision is now closed without difficulty by tension sutures of silkworm gut and the mucous membrane is sewed with a large number of fine black silk stitches to the skin (Fig. 481).

Postscript.—The result of the operation is most satisfactory. I have had quite a large experience in dissecting out x-ray burns. The pain from an x-ray burn is very often excruciating, and, as a rule, it disappears completely after removal of the injured tissue. I have had experience also in dissecting out x-ray burns from the breast in patients who were taking morphin to relieve the constant pain, and found that immediately after the operation the pain entirely disappeared and the desire for morphin, in spite of the fact that large amounts had been used for a good many months, disappeared almost entirely with it. In this anal x-ray burn we had very much the same experience. The old pain from the x-ray burn disappeared at once. The nervousness and desire for a moderate amount of morphin persisted for ten days or two weeks. Three-fourths of the wound healed by primary intention. A small part, about $1\frac{1}{2}$ inches in length, posterior to the anus, kept open, but healed within fifteen or twenty days completely.

I have had no more satisfactory result in surgery than the one we have obtained in this case. By a very simple operation the patient was permanently relieved from a most distressing condition. Since that time I have seen one other case very similar to this one, although not as distressing because the burn was not nearly as extensive nor as deep in degree. In this second case the patient was improving a good deal and I have advised her to wait for some weeks to see if repair cannot be obtained without operation. Where, however, an extensive persistent *x*-ray burn occurs about the anus I believe that the operation which I have reported should be the operation of choice, and that no colostomy or any extensive plastic is warranted. The operation might be modified somewhat, depending upon the size and shape of the burn, but the general principles employed are evidently sound, as shown by the splendid result in this case.

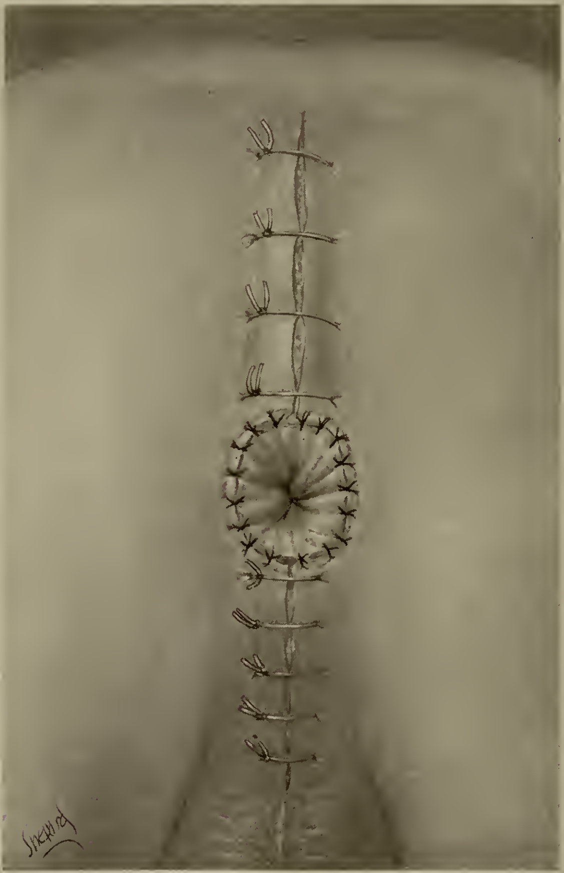


Fig. 481.—*x*-Ray burn of anal region: Closure with suture of mucous membrane of rectum to skin.

SUPRAPUBIC PROSTATECTOMY

Summary: Typical symptom-complex of prostatic hypertrophy; treatment preliminary to operation; suprapubic *versus* perineal prostatectomy; the suprapubic operation—control of hemorrhage; postoperative drainage; prognosis very good; carcinoma of the prostate—differentiation from simple hypertrophy—management; uselessness of attempting removal of prostatic masses which infiltrate surrounding tissues.

This patient is a man of seventy-two, who comes to us with a simple hypertrophy of the prostate. The picture is the typical one that we meet with so frequently, that of a man in advancing years with frequency of urination, irritation with this frequency, associated with a great urgency to micturate, especially when the individual is chilled, and associated sooner or later with attacks of retention. This man has had two distinct attacks of retention, one about three months ago and one about a month ago, each lasting four or five days, when it was impossible for him to empty the bladder without the use of the catheter. He came to us the day before yesterday giving in general the clinical history which I have outlined. He is in fairly good general health and has always been a strong, rugged man.

On rectal examination I found a moderately enlarged prostate, rather regular in outline and elastic to the feel, and not giving one the impression of being carcinomatous. I then had him urinate, and immediately after urination passed a catheter and found that he had 7 or 8 ounces of residual urine. A stone-searcher gave no evidence of stone. I advised him to have the prostatic enlargement removed, and I shall do this this morning under ether anesthesia.

It did not seem necessary to make any preliminary preparation for the operation by draining the bladder either with a catheter or by suprapubic incision. I do this frequently where there is evidence of sepsis, but where the general condition is good I prefer to do the prostatectomy and follow it with the necessary drainage. The route which we have adopted in this clinic is the suprapubic route almost entirely to the exclusion of any other method. It has seemed to me that this is the logical route to employ, especially since the studies of Zuckerkandl and Tandler have shown us that these prostatic enlargements are adenofibromata developed in prostatic tissue above the line of the ejaculatory ducts, and that, as a matter of fact, in our supposed prostatectomies we do not remove the prostate, but we remove the prostatic enlargement which is a neoplasm developed in prostatic tissue and projecting from the prostate, as a rule, upward into the bladder and covered simply by bladder mucosa, making a comparatively thin fibrous capsule. To my mind the anatomic facts demonstrated by Zuckerkandl and Tandler eliminate almost entirely the perineal route from consideration. I cannot help but feel that a well-executed operation of suprapubic prostatectomy in the hands of a competent general surgeon is a very much better procedure than any perineal operation, no matter how skilfully performed, in the hands of the greatest genito-urinary expert. In addition to the anatomic considerations involved there is much less interference with the musculature and nerve-supply that control continence, and much less risk of incontinence follows the suprapubic than the perineal prostatectomy. There is much less risk of injury of the rectum and there is much less risk of producing fistula after the operation. As to the mortality, I think that the suprapubic is quite as safe as the perineal, provided that in all septic cases the prostatectomy is preceded by drainage of the bladder continued sufficiently long to get rid of the septic condition and place the patient in a satisfactory general condition.

Proceeding to the operation, I want to call your attention in detail to the technic which we have worked out in our service. We make, as you see, a rather small suprapubic incision about 3 inches in length. This divides through the skin and suprapubic fascia down to the linea alba. We divide the linea alba and separate the rectus muscles down to the symphysis pubis. Behind the rectus muscles is found a layer of fascia which must be broken through with the finger close to the bone, bringing us

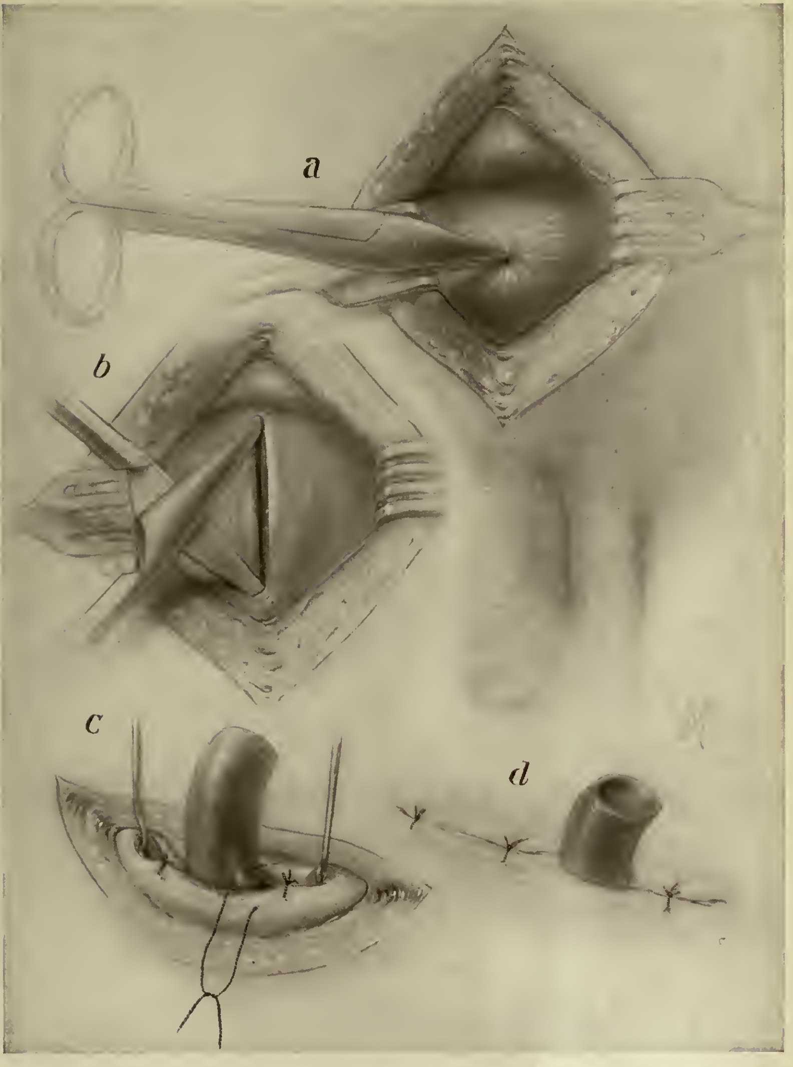


Fig. 482.—Suprapubic prostatectomy. *a* and *b*, Method of opening bladder with blunt dissecting scissors. *c* and *d*, Drainage-tube anchored in bladder wall and wound closed. Note blunt hooks which are used to elevate bladder in order to facilitate the placing of sutures.

down into the prevesical space. Before anesthetizing the patient I had his bladder filled with 12 ounces of warm boric solution. I can now feel very distinctly the bladder distended with this solution under my fingers. I free, with blunt dissection and my fingers, the bladder for a diameter of about 2 inches, so as to be perfectly sure that I do not pass through the peritoneum. Selecting a point about 1½ inches above the prostate I plunge into the distended bladder a rather blunt pair of scissors (Fig. 482, *a*). This is done under the direct control of the eye, so that we are absolutely sure that we have mistaken no structure for the distended bladder. As the blunt scissors pass into the bladder a little fluid escapes. Then the closed scissors are opened and a superficial opening about 1½ inches in length in the bladder wall is made (Fig. 482, *b*). I now introduce my fingers into the bladder and feel a very large projecting middle lobe. I can feel no evidence of calculi. Now I have the orderly raise the left knee of the patient, and, putting some vaselin on my gloved left hand, I introduce two or three fingers into the rectum and push the prostate well up toward the suprapubic incision. I now intro-

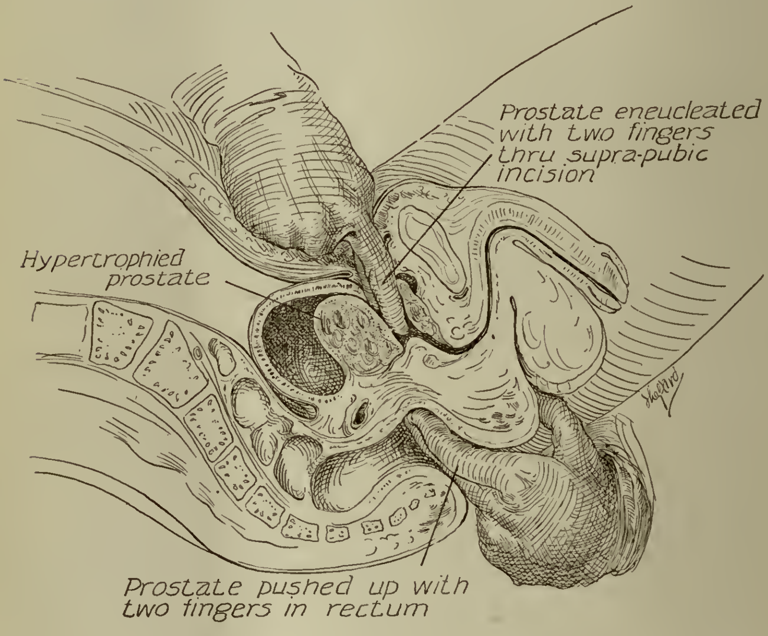

Prostate eneucleated with two fingers thru supra-pubic incision
Hypertrophied prostate
Prostate pushed up with two fingers in rectum

Fig. 483.—Bimanual enucleation of the prostate.

duce the index- and middle fingers of my right hand into the suprapubic incision. I hunt for the internal orifice of the urethra with my index-finger. I now bore my index-finger through the mucous membrane and thin layer of fibrous tissue covering the prostatic hypertrophy and find the line of cleavage between the adenofibroma and surrounding tissue. Following this line of cleavage, taking plenty of time, I swing out the entire prostate by this bimanual method with one hand in the rectum and the other through the bladder incision (Fig. 483).

In the ordinary case a prostatectomy is very simple and the line of cleavage easily found and the prostate easily swung out. You see that it has taken but two or three minutes for me to enucleate this large prostatic mass, and you see that I pulled it out in one piece, consisting of the supposed lateral lobes and the middle lobe. The hemorrhage is not severe, and I control it by still keeping the left hand in the rectum and packing the space from which the prostate has been removed with a dry laparotomy pad. I keep this pad in position for six, eight, or ten minutes, during which time complete coagulation occurs in the ruptured vessels that have been injured, and I then slowly and carefully remove this packing and find no internal hemorrhage.

After this step of the operation I now change my gown and gloves and then sew a good-sized $\frac{1}{2}$-inch rubber tube into the bladder incision. We have introduced a little surgical wrinkle that has proved to be of a good deal of value. We pick up the bladder with two bladder hooks and close the major part of the incision with two catgut sutures. I then introduce a third rather fine catgut stitch through the bladder wall and through the tube, so that when this is tied it fixes the tube firmly in the bladder (Fig. 482, *c*). The external incision is then closed with three or four sutures (Fig. 482, *d*). The wound is dressed with sterile zinc oxid paste so as to protect the skin of the lower abdomen from the irritating effects of the urine. The rubber tube is for a time attached to a rubber tube that runs into a bottle on the side of the bed or into a urinal between the patient's legs. We have had no serious hemorrhages in these cases except where the lesion was carcinomatous. We do not irrigate the bladder. I believe the patients are very much better if they are not irrigated and if the bladder is not disturbed in any way. At the end of three or four days the rubber tube is rotated on its own axis several times until the fine catgut stitch gives way, so that the tube can be removed. We feel that the patients are better if the tubes are removed on the third, fourth, or fifth day rather than if the tubes remain longer. After the tube is removed the patient is dressed frequently with zinc oxid paste over the line of incision and a big copious absorbent dressing is employed and changed sufficiently frequently to keep the patient fairly dry. It is necessary to change these every three or four hours. The wounds heal, on the average, in fifteen to twenty days, and the patients begin urinating normally sometimes as early as the tenth day; as a rule, however, not until the fifteenth day. Occasionally a fistula persists for three or four weeks, seldom more than four weeks.

We have had a surprisingly low mortality in these cases, and outside of the carcinomatous cases and the patients who come to us septic there has been practically no mortality in our series. The septic cases must be properly prepared for operation, and I am inclined to think from my experience that the best management is to do a suprapubic drainage under local anesthesia, get rid of the sepsis, and build up the patient until he becomes a safe surgical risk. In those cases where we have done a preliminary suprapubic drainage we do the prostatectomy, as a rule, ten days or two weeks later. I employ no cutting instruments of any kind, and very frequently do the second step of the operation, if the kidneys are at all involved, under gas, simply stretching the suprapubic drainage wound with two fingers, entering the bladder, and enucleating the prostate by the bimanual method which I have described. We do not use a drainage-tube in the after-treatment of these cases at all, and from the time of the operation employ simply a large copious absorbent dressing.

One cannot discuss these cases of prostatic hypertrophy without taking up at the same time the subject of carcinoma of the prostate, because in such a considerable number of these cases we find that the enlargement is not a simple adenofibroma, but is carcinomatous. Of course in the majority of cases this can be determined before operation by rectal examination and by the general clinical picture. A rectal examination frequently absolutely determines the hard nodular character of the mass, the location of the mass from below the line of ejaculatory ducts instead of above it, and sometimes also evidence of the bone metastases that are found in these cases of carcinoma of the prostate. My own views in regard to the handling of these cases of carcinoma of the prostate are not thoroughly settled even in my own mind. We have had some very satisfactory results where we have done a prostatectomy, thinking that it was probably benign, but where we have found that the specimen showed carcinoma. Several of these cases have lived from a year to three years after operation in comparative comfort. I would say that where a large carcinomatous prostate can be readily enucleated in much the same way as a benign prostate, this operation should be done. On the other hand, where at the time of operation we find that the prostatic enlargement infiltrates all the surrounding tissues so that it cannot be enucleated, I question very much whether any operation is of service to the patient. These cases we have handled by making the operation either purely exploratory, allowing the suprapubic wound to heal, or in cases where necessity demanded, making a permanent suprapubic drainage. We have done some quite extensive operations for carcinoma of the prostate, but I doubt very much whether an extensive radical cutting operation for removing carcinomas of the prostate is worth while.

There is one note of warning I should like to sound, and that is: Whenever in a prostatectomy we find no line of cleavage, and the prostatic mass infiltrates all the surrounding tissues so that it cannot be enucleated with any fair degree of force, one should, I think, accept at once the fact that it is inoperable and remove a section of the tissue for examination. It is too bad to persist to an unwarranted extent and tear out these infiltrating prostates with tremendous force, because many of these patients will die from hemorrhage and from the great traumatism inflicted, and very few of them will be benefited by the extensive serious operation.

We have had some unusual complications following our prostatectomies, which I desire to mention. In one of our cases death occurred from apoplexy at the end of the fourth week. We have had several deaths from pneumonia, and we have had one case of a subacute destructive process in the hip-joint with a pathologic dislocation of the hip-joint following what seemed to be a very satisfactory prostatectomy, as far as wound healing was concerned. We have, however, in our service been surprisingly free from trouble from hemorrhage or from infection. Taken as a whole, I know of no more satisfactory operation than that of suprapubic prostatectomy for the relief of a patient who is suffering severely from obstruction.

CLINIC OF DR. C. HENRY DAVIS

Presbyterian Hospital

CLINICAL TALK ON ANESTHESIA IN GYNECOLOGY AND OBSTETRICS

Summary: Necessity of co-operation between surgeon and anesthetist; training the intern; forty cesarean sections under local—the technic; plastic surgery and local anesthesia; nitrous oxid-oxygen---type of cases permitting its use; relative safety of chloroform, ether, and nitrous oxid-oxygen in pregnancy and labor; general conclusions—ether the standard anesthetic.

The master surgeon is familiar with the advantages and disadvantages of each anesthetic agent. His patients are individualized and the anesthetic chosen for the particular operation and the peculiar needs of the patient. It may be legitimate to have a hobby, but the surgeon who rides one cannot do the best for his patients.

A trained anesthetist is an important member of every operating team, but the surgeon, because of his broader experience, is better able to choose the anesthetic for a given operation. In borderline cases the anesthetic specialist should be consulted, but the surgeon must make the choice. The co-operation between surgeon and anesthetist is best when the surgeon is a capable anesthetist and the anesthetist has a good knowlege of surgical needs.

The training of the intern anesthetist presents a somewhat difficult problem, but it has been developed rather satisfactorily on the Gynecological Service at the Presbyterian Hospital. We have four interns and the service is divided into four quarters. The new man does the routine laboratory work, such as blood counts and urine analysis, acts as second assistant for private operations, delivers the multiparæ in the maternity, and is taught to give anesthetics on clinical cases. During his second quarter he delivers primiparæ in the maternity and is senior intern for the out-patient obstetric work. During the third quarter he gives all the anesthetics for operations on private patients, assists the senior, as necessary, with dressings, history taking, etc., and makes the histologic examination of the tissues. As senior he acts as first assistant in all operations, and under the direction of the attending physician cares for the gynecologic patients as well as pathologic cases in the maternity. This system gives a logical sequence to the training, and it has certainly proved more satisfactory than any other tried in the past.

Ether, nitrous oxid-oxygen, and novocain have been the anesthetics most commonly used during the past few years. Chloroform has been practically discarded. Rarely a few drops of chloroform are used to secure relaxation when it has not been secured with ether. Spinal anesthesia and the various sequences other than gas-oxygen-ether have not been used. The personal equation plays an important part in choosing an anesthetic, and we realize that it would not be possible for every operator to work with the same anesthetic in a given case. The following cases illustrate in a general way the choice of anesthetics for particular conditions.

Local Anesthesia.—Dr. Webster did his first cesarean section under local anesthesia in 1909. With the introduction of novocain the results were more satisfactory, and in 1915 Dr. Webster reported 13 cases which he had operated under this anesthetic. The writer did his first cesarean section under local, and thus far has not used ether anesthesia for this operation.

Technic.—The skin and superficial fascia are well infiltrated along the line of incision and to an inch or more to either side. A high incision with removal of umbilicus is the one of choice. The sheaths of the muscles are then infiltrated and the separated muscles exposed. Care must be given to the anesthetizing of the parietal peritoneum before it is opened, since it is very sensitive. With the abdomen open, 1 c.c. of pituitrin is injected into the uterine wall in the region of the broad ligaments so as to lessen the danger of getting it directly into the fetal circulation. Blanching of the uterus with a firm contraction usually occurs within a few seconds. With the edges of the incision pressed against the uterine wall a high anterior incision is quickly made in the uterus and the child delivered. The body of the uterus contains no sensory nerve-endings and, therefore, requires no anesthetic. The uterus, stimulated by the pituitrin, contracts and retracts, so that the operation is relatively free from bleeding. The uterine incision is now sutured with three or more layers of iodin catgut, care being taken to secure good approximation and avoid dead spaces. The last layer turns in the raw peritoneal edges. The abdominal incision is closed in the usual manner, care being taken to bring the muscles together so as to correct the diastasis. Usually no more anesthetic is needed for the closure. Quinin and urea-hydrochlorid has not been used.

These patients should suffer little or no pain during the operation, but there is the constant anticipation of getting hurt, and we find it advisable to keep cold cloths on the forehead and have an intern or nurse talk to them constantly about subjects other than the operation. Since 1915 we have combined the nitrous oxid-oxygen analgesia with the local anesthesia. This deadens the power of thought to a slight degree as well as the sensations of pain, and it has undoubtedly lessened the possibilities of surgical shock. About 40 cesarean sections have been performed under local anesthesia or the combined local anesthesia and nitrous oxid-oxygen analgesia by the Gynecological Staff of the Presbyterian Hospital, the greater number having been performed by Dr. Webster. The writer has performed 3 with the combined anesthesia during the past two years.

Plastic operations, such as repair of cystocele and rectocele or amputation of the cervix, are readily performed under local anesthesia. In some cases the operation would have been too dangerous with any other anesthetic. For instance: Mrs. L., aged twenty-three, entered the Presbyterian Hospital March 21, 1916. She had exophthalmic goiter and marked circulatory disturbance. But the thing which brought her to the hospital was the usual symptom complex resulting from a large rectocele and cystocele with retroversion and moderate prolapsus uteri.

Her mental attitude was such that the vaginal condition had to be treated preliminary to that of the goiter. With the infiltration of a $\frac{1}{2}$ per cent. novocain solution I amputated the cervix and repaired the cystocele and rectocele. The patient stated that she felt no pain or discomfort other than that from the lithotomy position, and she certainly showed no ill-effects from the operation. Some weeks later Dr. C. B. Davis removed one lobe of the thyroid under local. This patient was so pleased with her treatment that in the personal column of a newspaper she thanked the doctors and hospital for the care given.

The secret of success with local anesthesia depends on having a *sterile* solution and properly infiltrating the tissues. But the psychology of the patient must always be thought of both before and during the operation. While we have performed all sorts of gynecologic operations under local anesthesia, and believe it most desirable in some cases, it has very definite limitations. The field of local has been broadened by combining it with the nitrous oxid-oxygen analgesia.

Nitrous Oxid-Oxygen.—Drs. Webster and Bevan, of the Presbyterian Hospital, were among the first to use nitrous oxid in major surgery. But its limitations are such that they soon gave up the hope of using it as a practical substitute for ether. Dr. Bevan returned to the former practice of using the gas for examinations and short operations, while Dr. Webster for many years used nitrous oxid-oxygen alternately with ether in most of his major surgery. More recently he has used the nitrous oxid-oxygen-ether sequence with very satisfactory results.

The writer has had considerable experience both in administering and operating with nitrous oxid-oxygen alone and combined with ether, and from his experience questions the advisability of attempting to do very much major surgery under nitrous oxid-oxygen anesthesia. At present we have practically limited gas anesthesia to examinations and short operations, such as dilatation and curetage, colpotomies, etc. When ether is contraindicated because of some kidney or bronchial condition the nitrous oxid-oxygen may be combined with local anesthesia.

Nitrous oxid-oxygen analgesia has been popularized in obstetric work, and thus far has not been employed to any extent in gynecology. I have tried it experimentally in plastic cases, and believe that for some women it may be used satisfactorily during such operations as dilatation and curetage, amputation of the cervix, repair of cystocele and rectocele. One morning I used it for this type of work on two successive patients with excellent results. The first woman kept up a conversation with the intern during the entire operation, and only once did she complain of pain. The test was perhaps more severe in the second case, since she was a Greek and did not understand English. A few weeks later at another hospital I did similar plastic work on a physician's wife, the analgesia being administered under my direction by an intern who had no previous experience with the gas machine.

The surgeon who would use nitrous oxid-oxygen must familiarize himself with the contraindication to its use, as well as its limitations. It is not well borne by the very young or the aged. Respiratory difficulties are the most important contraindications. If the necessary relaxation cannot be secured without causing cyanosis, the writer believes the nitrous oxid-oxygen should be given with a higher percentage of oxygen and ether sequence, or completely discarded in favor of the ether. *Cyanosis is the most important danger sign of nitrous oxid anesthesia, and should never be permitted to occur.*

During the past few years we have been particularly interested in the **choice of the anesthetic during pregnancy and labor.** In cases of toxemia both chloroform and ether are known to increase the maternal danger. Some twelve years ago Dr. Webster began using nitrous oxid-oxygen in this type of cases. The results were so satisfactory that he gradually broadened its use to all types of operative obstetrics. The routine use of the nitrous oxid-oxygen analgesia in normal labor is of more recent development, and with its more general usage has arisen a few questions regarding its safety.

Last winter the writer conducted a series of experiments on guinea-pigs in the attempt to secure additional information regarding the relative safety of chloroform, ether, and nitrous oxid-oxygen in pregnancy and labor. The anesthetics were all given in a vaporous or gaseous condition to groups of pregnant and non-pregnant guinea-pigs. These experiments were described in some detail before the Chicago Gynecological Society, May 18, 1917, and will be published in Surgery, Gynecology, and Obstetrics. The correlation of these experiments and clinical observations seemed to justify the following conclusions:

1. The administration of chloroform, ether, and nitrous oxid-oxygen to pregnant or non-pregnant guinea-pigs, if given over long periods and repeated on successive days, causes degenerative changes in the tissues. The changes found in the liver are the most constant. Those following the use of chloroform are the most severe.

2. If the degeneration is not sufficiently great to cause death, the animal gradually recovers from the effects of the anesthetic, but it seems probable that the results of the injury may persist for a considerable time.

3. With ether and nitrous oxid-oxygen the changes are chiefly those of cell asphyxiation, yet it is evident that the cells recover more slowly following ether than they do after nitrous oxid. The central necrosis following chloroform is very different from that seen in asphyxiation, and more permanent.

4. The long-continued use of these anesthetics must be considered dangerous to the fetus *in utero*. Chloroform and nitrous oxid anesthesia seem more dangerous to the fetus than ether. Continuous nitrous oxid-oxygen analgesia, while less dangerous than the anesthesia, should not be administered over long periods.

5. The marked fatty degeneration of the livers in all three of the young born after their mothers had only one hour of chloroform-oxygen anesthesia shows that pure oxygen does not remove the danger of chloroform.

6. The changes following the use of nitrous oxid being identical with those seen after ordinary asphyxiation, it seems fair to believe them due to long-continued interference with cell oxidation.

7. There is no reason for believing that the intermittent use of four or six inhalations of nitrous oxid-oxygen at the beginning

of the uterine contractions can be of any material danger to the fetus. The nitrous oxid absorbed has been largely eliminated by the end of the contraction, and normal metabolism is not disturbed during the interval.

8. Since it is evident that anesthesia during pregnancy may be a source of considerable danger to the fetus, it is believed that operations should be avoided, if possible, during this period. The fetus *in utero* and the newborn would appear to stand ether *anesthesia* better than chloroform or nitrous oxid-oxygen.

CLINIC OF DR. FRENCH S. CARY

College of Medicine, University of Illinois

STUBBORN CYSTITIS

Summary: Necessity of proper diagnosis in suspected cystitis—essential rôle of the cystoscope; surgical treatment; causes of stubborn cystitis.

The resistance of cystitis to treatment may be based on conditions in the bladder proper or to complications arising outside of this viscus.

A foreign body in the bladder, after cystitis has developed, will maintain this pathologic condition in spite of all therapeutic measures until the extraneous body is removed. The intake of irritating substances via the alimentary canal will, to a certain degree, interfere with the effect of local applications; but such conditions are easily detected, and it will remain to discuss other conditions that do not force themselves so easily on the mind of the observer.

But two conclusions may already be drawn from these preliminary remarks: First, the local conditions must be thoroughly investigated; second, the general condition and behavior of the patient must also be the object of a complete analysis. Unfortunately, it is still the custom in many quarters to accept the diagnosis of cystitis on the mere presence of pus in the urine, and on the so-called classic subjective syndrome of cystitis, that is, pain in the bladder region, dysuria, and turbid urine.

The patient is then subjected to the routine flushing of the bladder, and only when the symptoms persist for a long time or become aggravated is a thorough examination thought of. This method is fraught with several drawbacks; not only is the patient not relieved after having been tortured by futile treatments, but the underlying conditions may have become so firmly established as to make a real cure more difficult. We know, or ought to know, that the above-mentioned syndrome may be caused by conditions other than cystitis, such as pathology in the posterior urethra, in the prostate, in the seminal vesicles, in the kidney, and in other structures which happen to become inflamed and secondarily attached to the bladder wall. It, therefore, becomes imperative not to make the diagnosis of cystitis unless convincing evidence of this condition is established, and this can only be accomplished by an ocular inspection of the bladder wall. In females additional information may be gained by palpation, which is particularly instructive, and *x*-ray investigation may also help in the diagnosis. What are the changes in the bladder wall that are apt to cause and maintain a stubborn cystitis? Foremost under this heading we must quote ulcers with extension of the inflammation into the deeper layers, thus leading to extensive infiltration, then involvement of the lymphatic tissues in the trigonum, and traumatic granulomata.

It is a matter of experience that the cystitis surrounding a suppurating defect in the bladder wall will not heal until the ulceration has been made to become epithelialized. This again impresses on one's mind the importance of cystoscopy. There is no way of ascertaining the presence of an ulcer and determining its character other than by the ocular investigation of the interior of the bladder. At the same time the rational therapy of such an ulceration is carried out most successfully by endovesical therapy. The bottom of the ulcer is cureted out and cauterized by means of a galvanocautery introduced through an operating cystoscope. After the ulcer has once healed following this instrumentation, a few applications will cure the concomitant cystitis, which up to this time has resisted all therapeutic efforts. It may not be amiss to mention on this occasion that flushing out of the bladder is not of great therapeutic value for the cure of a cystitis. Its only advantage lies in the cleaning up of the inflamed mucosa, making the mucosa more accessible to the effect of the small quantities of more concentrated solutions, the so-called healing drugs which are introduced. It has to be mentioned though, that if a cystitis is maintained by syphilitic efflorescence, a not uncommon occurrence, a cure will only be obtained by general antiluetic treatment. The diagnosis of such specific pathology is made by the characteristic aspect of these prominences—they are typical broad condylomata—and by other signs of syphilis in the body.

If the infiltration of the bladder wall has become very extensive, only operative interference will furnish a satisfactory result. The diagnosis of such infiltration can easily be made by the reduced capacity of the viscus; this is marked not only by the frequency of the painful urination but also by the firm resistance offered by the bladder against the attempt to distend it to the normal degree by injecting fluid into it. The mucosa deprived of its sheen gives the impression of rigidity, and numerous submucous hemorrhagic patches testify to the intensity of the engorgement. The therapy in such cases consists in suprapubic cystotomy, freely splitting the bladder wall. Three indications are answered by this procedure: first, free drainage; second, the unburdening of the bladder wall and relief of the inflammatory tension, and finally, the capacity of the viscus will be re-established by the addition to the bladder wall furnished by the new roof constructed out of the fibrous tissue that finally will close the granulating wound. It is quite obvious that in such cases drainage by a perineal boutonniere will not be sufficient. In cases where the lymphatic tissue underneath the trigonal mucosa becomes involved by this inflammation the condition is revealed to the eye of the cystoscopist: the trigonal mucosa appears to be studded with very fine granula, each of them surrounded by a red areola; and around the internal urethral orifice there appears numerous proliferations of a very dark hue. This kind of of a cystitis is, as a rule, of a very stubborn character, and in most instances yields only to a thorough curetage of the involved area; this interference is carried out through the operating cystoscope, or in females it can be done by introducing a small intra-uterine curet through the urethra into the distended bladder, and by controlling the action of the instrument with a finger placed in the vagina.

If the bladder, while in a state of inflammation, be subjected to trauma of some severity, a vicious circle which will maintain the cystitis may be established in the following way: a crack produced in the inflamed mucosa by the trauma stands a very poor chance of healing, and, as a rule, luxuriant granulations will sprout up, the decay of these preventing the inflamed mucosa from returning to normal condition. Here, again, the rational therapy consists in scraping off these granulomata and cauterizing the base, both procedures to be carried out by means of the operating cystoscope. It has been mentioned before that if a foreign body is once introduced into the bladder, and has produced a cystitis, that the latter will not heal until the foreign body has been removed; such foreign bodies may be introduced through the urethra, or silk ligatures may immigrate into the bladder, or concretions may be formed as a result of the stagnation of infected urine. The removal of these is the first step for successful handling of such a case. Another species of pathology causing and maintaining cystitis is a diverticula of the bladder wall. If one considers for a moment that most of the diverticula are bottle shaped it will not be surprising to know that free drainage of this accessory cavity cannot take place, and that the contents of this sacculation are always in a state of decomposition, not only infecting the wall of the diverticulum but also exerting the same damaging influence on the balance of the bladder wall. A cure of such a case of cystitis will depend on the removal of the cause, that is, extirpation of the diverticulum. Irrigating the bladder in such cases will furnish only temporary alleviation. Among the inflammatory conditions of adjacent organs that play a prominent rôle in various types of stubborn cystitis must be mentioned infection of a patulous urachus. The diagnosis is made by the cystoscope, and the cure consists in amputation of this hollow strand. Pus-tubes or parametric exudates becoming attached to the bladder wall cause cystitis ex-contiguo, and the cystitis remains until the removal or drainage of these infectious accumulations is obtained. The inflammatory infiltration of the bladder wall is demonstrated by the appearance of the so-called bullous edema of the mucosa. It is very evident that if once cystitis is established due to gonorrheal infection, this condition will remain until the posterior urethra and prostate are cleaned up, and if obstructions to the urinary flow are present these must also be removed. A urethral stone impacted in the parietal part of the urethra may also produce and maintain a circumscribed cystitis until the stone is removed. Tuberculosis of the bladder and kidney and pyonephritis may also be the cause of a circumscribed stubborn cystitis.

CLINIC OF DR. CARL BECK

North Chicago Hospital

TEMPORARY ENTEROSTOMY

Summary: Three cases illustrating the value of enterostomy as a vent for gas and feces in protecting suture lines further down the bowel; type of cases in which such a vent is necessary.

A temporary enterostomy occasionally serves a very useful purpose, and it is my present intention to discuss the subject with you, illustrating my remarks by means of the records of 3 patients whom I have had under my care during the last few months. The record of the first patient reads as follows:

A. G., an Italian laborer of more than middle age, ate a very heavy breakfast and went to work. While lifting a railroad tie with one of his fellow-workers the man dropped his end of it and the other end struck the patient in the abdomen. He immediately had very severe pain, vomited, and was taken home in a shocked condition, with a rapid, thready pulse. He had had a double inguinal hernia for many years, which had not bothered him very much and for which he had never worn a truss. Through abdominal pressure he pressed some of the abdominal contents out into his hernia, and when my assistant, whom I sent out for the purpose, examined the patient about two hours after the injury, not being able to get a history, he thought that the hernia was the cause of the trouble, and that the incarceration of the hernia was responsible for the vomiting and other symptoms. The patient was brought to the hospital shortly afterward. The abdomen was extremely tender and very rigid, and while his pulse had rallied somewhat and was less frequent, there was something about his face which told me that there was an intestinal perforation; it was the expression of anxiety coupled with the frequent eructations and the absence of a bowel movement. There was also on one side of the abdomen more tympany than we could account for in a distended bowel, and I took it for free air in the peritoneal cavity. After watching him for a few hours, he was operated on at 3 P. M. of the same day.

I found the abdomen filled with a flaky fluid, slightly yellowish in color and of the nature of duodenal contents. The intestines were in a congested condition, distended, and presenting the characteristic pathologic appearance of a general peritonitis following perforation of the intestine. After a short while the perforation was found midway between the ileum and jejunum. It was an oblong tear, with an everted mucosa, and with only a small opening in the mucosa. I mopped out as much as I could of the fluid and sutured the perforation. I intended at first just to drain the peritoneal cavity, but on second thought I made an enterostomy above the location of the tear. Perhaps I might have sewed the rent itself into the abdominal wall, but I preferred an entirely fresh portion of the bowel for this purpose well above the lesion. I also drained the peritoneal cavity at a point somewhat below the site of the enterostomy (Fig. 484). The patient rallied and made a very good recovery. About three weeks after the injury we were able to suture the enterostomy without leaving the slightest defect in the abdominal wall. Some three months later we were able to make a radical operation for the cure of his herniæ, and now the man is well and back at work.

During the past five years I have had a number of cases of intestinal operations belonging to a class which formerly gave the highest mortality, and which, through the application of the simple device of enterostomy, have almost all been cured.

Operations on the intestinal tract are practically harmless if we have to deal with normal bowel and normal peritoneum. The technic of the operation is so perfectly developed that we can depend upon the success of the same. The bowel itself has the greatest tendency to unite if severed. I remember an instance in which a beginner in abdominal surgery had the misfortune to sever the small bowel. On discovering the accident, not knowing the technic of intestinal suture very well, he put four interrupted sutures through the walls of the transversely severed bowel, and the patient made an uneventful recovery without even a fistula. It was a normal bowel.

This is the explanation for the many successful gastro-enterostomies and entero-enterostomies which are done every month. These are cases in which there is no pathologic condition at the site of operation. Quite different is the condition when we have to make our anastomosis between loops of bowel which are themselves diseased, as, for instance, in the resection of an incarcerated bowel where the loops have been the seat of marked passive congestion for some time, or in a case of perforation of the bowel where the intestinal contents have pro-

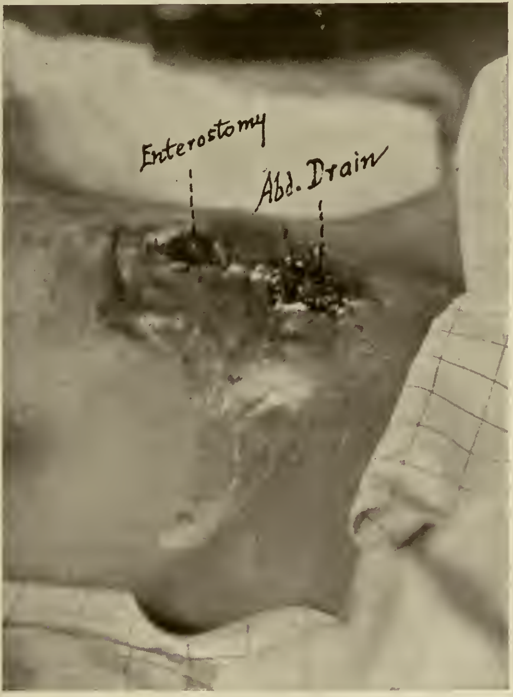


Fig. 484.—Enterostomy of the healthy ileum above the site of perforation; drainage-tubes below, draining general abdominal cavity.

duced an irritation of the peritoneum, or in a bowel which is acutely inflamed from surrounding abscesses. In these cases the sutures of the intestinal wall break and tear out and fistulæ are usually the result. In a case of ileus, for instance, the result of internal strangulation or of paralysis of the bowel, operations on the intestine are very bad, and no matter how skilfully performed the condition of the bowel itself will prevent union. If we can prevent the part of the bowel on which we have performed an operation from functioning—that is, if we can put it at rest by deviating the flow of the intestinal contents toward the outside through a fistula above the field of operation—we improve the conditions for healing very materially, and in this way are able to save and get union in cases in which we otherwise would not have any success.

It is advocated in many instances to drain the abdomen without such an enterostomy, but this is not quite so successful. More especially, however, has this method been of service to me in work on the large intestine where a colostomy of the right side, or rather a cecostomy, has allowed very good union of a tear, say, in the sigmoid or upper rectum. In quite a number of cases which I have operated on in former years this class of patients had often a tedious and sometimes absolutely unhealing fistula of the intestine. It is in the cases with pyosalpinx, which necessitate a great deal of manipulation on account of the very firm adhesions, and in which infiltrated areas of the bowel often lead to the perforation of the bowel, that cecostomy may prevent a fistula or even save a life. I will give you an instance of this.

A Servian woman of thirty-eight years was brought to the hospital by her husband in a very serious condition. She had a double pyosalpinx, infiltrating the abdomen to such an extent that there was no possibility of distinguishing any anatomic structures. When the laparotomy was performed, and the tube on the right side ultimately separated, it became evident that a part of the wall of the tube, which had perhaps before that perforated into the bowel, had been so intimately connected with the bowel that in removing the tubal wall the bowel had been torn right across. After removing the tube I trimmed the borders of the tear so as to make them symmetric, and then put in three rows of sutures, including first the mucosa, then the submucosa, and finally the muscularis. On top of that I sutured a little of the omentum, so as to make an omental graft over the united bowel. Then I put a small drainage-tube into the culdesac. After closing the abdomen I made a gridiron incision over the region of the cecum, bringing the cecum out. Then I made a small cecostomy. The patient made a very good recovery. Most of the fecal contents came through the cecal opening. In three weeks the abdominal wound with the transversely torn bowel closed entirely. After four weeks the cecostomy also closed and the patient was perfectly well. This case if treated according to the ordinary method prevailing among surgeons and gynecologists would positively have resulted in the formation of a very intractable pyostercoral fistula.

Another instance in which cecostomy does a great deal of good is in operations on the rectum, as in the removal of a cancer. The following case is a typical example:

Mr. A. A., aged fifty-two years, of Swedish descent, was admitted to the hospital January 6, 1917. One brother died of tuberculosis of the lungs at the age of twenty-four. For the last twelve years the patient had suffered from hemorrhoids, for which he was treated by a so-called specialist. A few days before admission he had a very severe hemorrhage while in Milwaukee, necessitating his staying in a hospital for twenty-four hours. At this time he lost about 1 quart of blood.

Examination showed piles around the anus, and inside of the rectum about 1 inch above the anus an ulcerated tumor about the size of a silver half-dollar could be palpated. The borders of the tumor were projecting. The tumor itself was movable, rather hard in consistency, and bled easily. The patient was anemic.

The tumor was regarded as a carcinoma, and on January 20th an operation for its removal was performed. Considering the location and movability of the tumor, I decided to excise it within the healthy tissue under the guidance of the eye in a somewhat atypical manner. The patient was placed face downward with the buttocks elevated. An incision was made over the coccyx and the coccyx removed. The incision was then carried through the sphincter clear into the rectum. Every blood-vessel was caught as it was cut, and the two borders of the incision were held apart with threads. This opened the rectum to our view, and the area of the infiltrating ulcer presented itself. It was somewhat to the left of the median line about 2 inches above the mucocutaneous junction. The ulcer was excised, making all incisions in healthy tissues. All the vessels were caught and the various layers of the incision approximated by suture with great exactitude. Then the posterior incision through which the rectum had been opened to our view was closed by continuous catgut sutures. The skin was brought together with sutures of silkworm-gut. A small strip of gauze was left in the upper wound. The patient was then turned on his back and a right cecal colostomy was made, with a view to draining the bowel fully through the colostomy, thus giving the wound in the rectum a chance to heal.

On the day following the operation the colostomy was opened and a rubber tube sutured into the bowel. The patient made an uneventful and absolute recovery. The sutures healed by primary union. Most of the fecal matter drained through the colostomy. There was very little discharge from the coccygeal region, and after a few days it closed.

On March 1st the colostomy was closed by inverting in the usual manner under local anesthesia. The wound healed by primary union within a week.

On March 15th the patient, who now had regular daily bowel movements and absolute control of his sphincter, was examined proctoscopically, and a linear scar was found at the place from which the ulcer had been removed.

Microscopic examination of sections from the ulcer proved it to be a carcinoma. The patient left the hospital on March 15th perfectly cured.

CLINIC OF DR. FREDERIC A. BESLEY

Cook County Hospital

FRACTURES

Summary: Responsibility involved in the care of fractures; definition, classification, and etiology; the repair of fractures; fate of bone-transplants.

Case I. Differential diagnosis between sprain of the hip and fracture; eight points in the diagnosis of fractures; fear of hypostatic pneumonia in fracture of hip unwarranted provided pain is prevented.

Case II. Multiple bone cysts with pathologic fractures; the intramedullary bone-splint.

Case III. Old fracture of the humerus with injury of the brachial plexus; the pernicious board splint.

Case IV. Ecchymosis as a sign of fracture; the pathology of blebs.

Case V. Fracture-dislocation of the elbow; functional *vs.* anatomic results; importance of the fluoroscope in difficult cases.

Case VI. Compound fracture of femur; free drainage the secret of success in the management of acute suppuration.

Case VII. Fracture of fibula; fallacy of the fracture-box; the blanket hammock; when to apply the permanent splint.

Case VIII. Fracture of femur (intracapsular); extension in fractures—the Steinman method.

THIS morning I am going to take up with you a discussion of the general features of fractures. The responsibility of the physician or surgeon who assumes the care of a fracture cannot be overestimated or overstated. There is no one condition that I know of in the whole field of medicine or surgery that involves so much responsibility on the part of the physician in charge. In fact, the responsibility has seemed so great to some good surgeons throughout the West that they have refused not only to care for a fracture, but to see a fracture in consultation. That gives you some idea of the responsibility involved in the care of fractures as many surgeons see it. Many years ago I used to be glad to take care of a fracture. At the present time I wish I had never seen a fracture.

That brings up the question, What is a fracture? There are several definitions. This, I think, is the definition of Gross: A fracture is the loss of continuity of a bone or cartilage due to direct or indirect violence or to muscular contraction. Fractures have been divided or classified on many bases. A fracture is either complete or incomplete. Of the incomplete fractures, there are the depressed, the splintered, and the so-called "green-stick" varieties. According to another classification, fractures are divided into the simple and the compound. By a simple fracture we mean a fracture without severe laceration of the soft tissues and, particularly, without breaking the skin. A compound fracture is one in which the overlying soft tissues are so involved or lacerated as to admit of the exposure of the fracture to the air. Get that clear. In no sense is a fracture compound unless the fragments are exposed to the air. Another classification is based on the direction of the line of fracture with reference to the long axis of the bone. A fracture may be transverse, spiral, or longitudinal. It may be a perfectly transverse fracture, an oblique fracture, or it may be designated by any term that will describe its relation to the shaft of the bone.

Another classification is based on how the fracture is produced—whether it is due to indirect violence or to direct violence. That brings us into the realm of the etiology of fractures. Fractures occur more generally in men than in women because men are more exposed to injury. They occur most commonly between the ages of twenty and forty. There are certain predisposing factors, among which may be mentioned old age. Fewer fractures occur in children than in old people. Then there are certain conditions of the bone that must be considered among the predisposing factors, such as inflammatory processes, cysts, and tumors. When a fracture occurs in bone of this type, it is known as a pathologic fracture. It may follow violence of a very slight degree. Sometimes turning in bed will produce such a fracture. Trophic disturbances, such as occur in syringomyelia or tabes, may also be factors in producing the fragility that renders bone more easily fractured. Fragilitas ossium, a condition seen in some children, you are familiar with. It is now thought that some cases of fragilitas ossium are due to a fault in the functional activity of the thyroid gland. Calcium metabolism is probably controlled by the thyroid secretion, and when that secretion is interfered with the bones may become fragile and be easily fractured. Children who have had nine, ten, up to eighteen fractures have been treated with thyroid extract with favorable results.

A word might be said here about the repair of fractures. A fracture, it seems to me, heals by granulation just as any tissue heals by granulation. Let us see what happens when we have a simple fracture. The bone is fractured. This represents the medulla, this the medullary canal, and this the periosteum (drawing). When the bone is fractured, what happens? First there is more or less tearing and laceration of the tissues. The extent of the laceration depends entirely upon the extent of the fracture. Let us assume that the bone is broken transversely, the periosteum is torn, the Haversian canals are ruptured, and the medulla is torn across. This disruption is accompanied by a tearing of the soft tissues. Immediately there is an extravasation of blood, first, from the ends of the bone, and second, from the tissues around the bone. The amount of extravasation depends entirely upon the amount of laceration of the soft tissues, the degree to which the bone may be crushed, and the extent of the separation of the ends of the bone. The second stage is that of clot formation, and in the third stage the adjacent living cells begin to proliferate. From the histologic and physiologic evidence now at hand I think we may assume that the periosteum, the endosteum, and the cells in the Haversian canals all take part in the repair of fractures. The callus, consisting at first of blood-clot, is gradually transformed by the invading granulations into osteoid tissue, and then, by the addition of calcium salts in response to the specific functional activity of the osteoblasts, into true bone. In its early stages the callus is superabundant, but if allowed to undergo its natural development, free from the disturbing influences of infection, excessive motion, or general disease processes, it shrinks to the size best compatible with functional demands, and eventually assumes the histologic structure of the bony shaft of which it is a part.

Before we take up these individual cases let me say a word concerning the fate of bone-grafts. The fate of bone-transplants is so intimately connected with the question of bone repair that you cannot separate them. Ollier was the first to make the statement that a bone-graft was useless without periosteum. If my recollection is correct, that was in 1869 or 1870. In 1890 Barth, by a large number of experiments, showed that the bone-graft did not live, no matter whether it was an autogenous graft from the same individual or a graft taken from someone else. It died, regardless of whether it had the periosteum connected with it or not. He maintained, as did Dr. Murphy all his life, that a bone-graft was merely a scaffolding over which new bone grew and over which new blood-vessels traveled. Barth has lately, within the last few years, changed his opinion. Axhausen in 1907–08 went back to the original theory of Ollier. That theory was that the life of the bone-graft was dependent upon the periosteum, and without the periosteum it would not live. Macewen, in his great work, seems to think that the periosteum plays only a minor part in the repair of fractures and in the grafting and transplantation of bone. Out of all this confusing mass of literature and out of all this confusing mass of deduction, what can we say from the practical side? In regard to bone-grafting, we may say that it is a good thing and that a bone-graft, with or without its periosteum, with some endosteum and with some cancellated bone, placed in such contact with living bone or living tissues that its blood-supply may be preserved in some measure and so related to surrounding structures that a functional demand is made upon it, will survive. It is not right to draw conclusions concerning the viability of bone-grafts from the results in the cases of grafts that were so placed as to be without function. For the same reasons the changes occurring in periosteum transplanted with or without a pedicle into soft tissues does not have any weight in our final deductions. If you will think of the ordinary conditions that pertain in your experimental work on dogs and in your clinical work on patients, you will agree with me that there is very little, if any, of the bone-graft that gets sufficient blood-supply to keep any of the tissues growing. When you put in a bone-graft that much of the graft lives, whether it has periosteum or not, that gets immediate and free blood-supply. It is my belief that in any bone-graft if you find that some of the periosteal tissue lives and reproduces bone it is because that portion of periosteum achieved an early vascular supply, and the same statement applies to the cells in the lacunæ and in the marrow spaces.

Now let me say just one more word about the production of the callus, the permanent callus, as it is spoken of in text-books. That term is to be disregarded. There is just one callus. The primary callus is larger than the permanent callus because nature throws out an excess of material apparently in order to facilitate repair, and then proceeds to cause the resorption of the excess, leaving only that which is functionally necessary. The osteoclasts—and we will assume that the osteoclasts are the cells that destroy the bone—digest and remove the unnecessary callus. To summarize: first there is the fracture, and then, in the order named, oozing, clotting, cellular proliferation, calcification, and removal of excess callus.

CASE I. SPRAIN

This patient presents a rather striking though not uncommon condition. Twelve years ago she had a fracture of the neck of the femur. She had a fairly good result from treatment at that time, as we assume from the fact that she has been getting around on the limb quite freely since. She is back now with a history of a slight injury and some pain and disability in the joint. The *x*-ray shows an apparent line of fracture across the neck of the femur, with a separation of the fragments of at least $\frac{1}{4}$ inch. There is no evidence of impaction. Now I should like to present this as a pathologic fracture occurring at the site of the previous fracture in which there had been some rarefaction of the bone and some failure of union, but from the appearance of the *x*-ray I cannot say that, because there is very good compact bone with very little rarefaction on each side of this line of apparent fracture. Therefore, I believe that if this is a fracture it must have resulted from a degree of violence which would have produced a fracture even if the bone had not been fractured twelve years ago.

But so far we have studied but one aspect of the case, and clinically there is nothing one should more assiduously avoid. Here is the patient. She suffered the present injury only a week ago. I wonder if she really has a refracture, or if that apparent solution of the bony continuity disclosed by the *x*-ray does not indicate merely the old line of fracture which is the seat of fibrous, not bony, union?

On making a diagnosis of fracture, generally speaking, the first thing one gets is a history of injury, usually a violent injury. Next we inspect the injured part and take note of any local deformity, malposition, ecchymosis, or swelling. Then we may palpate the injured region in an endeavor to locate a false point of motion and crepitus. We used to depend upon crepitus very largely to make a diagnosis of fracture. I should like to state that I think it is five or six years since I felt crepitus that was intentionally elicited. Do not feel for crepitus and do not feel for a false point of motion if you have access to an *x*-ray. The sixth point in the diagnosis is loss of function. Wherever there is a fracture of bone, there is associated loss of function. Seventh, we search for a point of local tenderness. This is usually easily located on subcutaneous bones, and is surprisingly definite, painful on pressure, and well localized. It is a factor of great value. Eighth, and most important, is the *x*-ray picture. The best *x*-ray pictures are those taken in pairs at direct right angles to each other, or stereoscopic pictures. I prefer the stereoscopic pictures. A single picture is of no value except to tell you that a fracture exists, and it may even fail to do that. I divide the factors concerned in the diagnosis of fractures into the following three groups, arranged in the order of their importance: First, the *x*-ray; second, the physical examination; third, the history. Usually a probable diagnosis can be made upon any one of the three factors, and a positive diagnosis by either of the first two, but in doubtful cases all three should be given due attention.

In the present case our diagnosis from the *x*-ray is fracture, probably as the result of considerable violence, but in checking up the history we find no support for this assumption, and physical examination yields none of the general signs of fracture. We are forced to conclude, therefore, that when the patient fell she overstretched or tore some of the soft tissues in such a way as to render the hip painful and to limit its functional capacity. A patient with a fracture of the neck of the femur is never able to move it as much as this patient is able to move hers. As you see, she has it under fair control. If this hip really were fractured what picture would be presented here? We would find that this woman could not use her limb at all, and that all attempts at active motion would be associated with severe pain. On inspection, the limb would be found lying relatively helpless, in marked eversion, and the tip of the great trochanter would lie $\frac{1}{2}$ to $1\frac{1}{2}$ inches above a line connecting the anterosuperior spine of the ilium and the tuberosity of the ischium—the Roser-Nélaton line. These facts alone would probably be sufficient to establish the diagnosis.

Why is this woman put on a back-rest? The intern tells me it was done in order to prevent the hypostatic pneumonia that occurs in old people, and especially in this class of cases. Patients of this type are thought not to stand confinement in bed very well. I would like to say that I think our teachings have been a little wrong in that regard. We have been afraid to keep these old people in bed without justifiable clinical evidence to the effect that it does any harm. Frankly, I have seen a great many old people with fractures of the femur and I do not recall but one who got a hypostatic pneumonia. I do not recall but one in which I could say that confinement in bed affected the general health. In fact, I have seen many of these patients do pretty well in bed, particularly if they were relieved from pain. I think that relief from pain is of more value in preventing this complication than anything else. We are putting these people up on back-rests largely because our fathers did and because we have not yet learned that pain, and not recumbency, is the enemy to be conquered.

CASE II. FRACTURE OF FEMUR

This is an unusual condition. In this case we find multiple fractures in a femur which shows distinct pathologic changes which antedate the fracture. Here in the neck and in the trochanter we see areas of rarefaction, rarefaction that is probably due to a so-called fibrocystic inflammation. We are coming to believe that most bone-cysts are due to an inflammatory process, The bone-cysts we see in long bones are not true cysts, since they have no epithelial or endothelial lining. The adamantine and the dentigerous cysts occurring in the jaws are true cysts in the bone with an epithelial lining. These cavities are not. They are the result of a localized rarefying osteitis with bone destruction and replacement fibrosis of the destroyed osseous tissue. Usually these cavities in bone are not empty, but contain a cellular fibrous tissue, sometimes with many giant cells, and with the older lesions a lining of adult fibrous tissue with a core of liquid.

This patient fell down a flight of stairs step by step. She sustained a fracture of the femur at the neck, a fracture at about the middle of the femur, and a third fracture just a little below the middle of the femur. You will note from the *x*-ray picture that there was considerable separation of the fragments and that there was also marked deformity.

This patient has been operated on and the wound has healed by first intention. Only the two lower fractures were handled at operation, since the fracture in the femoral neck was impacted and, therefore, semisplinted in position. She is evidently doing very well. At the operation intramedullary bone-splints were introduced. I believe that the intramedullary bone-splint is the best means of fixing, in case of fracture, the fragments of bones which have a central canal. I think, however, that dead bone from an ox is just as suitable for this purpose as bone taken from the tibia of the same individual. I make that statement knowing that it is open to criticism, and perhaps justly so. I make that statement because I do not believe it possible to put in an intramedullary splint, even though it be autogenous, in such a way that any of the bone-cells will get a sufficient blood-supply to enable them to live. I do not believe that a medullary splint lives as new bone. I am not sure that we want it to live as new bone. An intramedullary splint holds the ends of the fragment in accurate apposition and repair goes on just as it goes on at the original site of the fracture. Whenever you put bone into the medullary canal it is necessary to ream out the canal, and in so doing the endosteum is destroyed. The blood-vessels are likewise destroyed in that reaming-out process. A clot forms between the intramedullary splint (no matter whether it is autogenous or taken from an ox) and the endosteum in such a way as to preclude the early coming through of cells and nutriment to the graft, so that finally it is always absorbed.

CASE III. FRACTURE OF THE HUMERUS—PARALYSIS

This is an old fracture. This splint is put on for the purpose of illustration; it is put on to show you what not to do. The essential thing in the treatment of every fracture, of course, is the diagnosis—the diagnosis of the location of the fragments, the diagnosis of the position of the fragments, the diagnosis of our ability to perform the reduction, and the diagnosis of the position of the fragments after we think they are reduced. The text-books say in discussing the treatment of fractures that the fragments should be reduced as early as is consistent with good work and then held in position simply and easily. You will agree with me that there are text-books with pictures of this sort of apparatus. Every one you look at is the same. Here we see two boards, padded with cotton wadding, bound, one on the dorsum and the other on the ventral surface of the forearm, extending from the elbow nearly to the tips of the fingers. This is given as a method of treatment for Colles' fracture, for fracture of the lower end of the ulna, and for fracture of both bones of the forearm. I am perfectly willing to stand by the following statement: If all the fractures of the lower end of the radius I have ever seen, the so-called Colles' fracture, had never been seen by a physician or a surgeon, they would have given better results than were obtained. I mean by that just this, that in many of those cases the fracture was not reduced, and the means which were employed to hold the fragments in place did more harm than the primary wound would have caused if it had been left unmanipulated. Why? A Colles' fracture is usually an impacted fracture. There is very little tearing or laceration of the soft tissues after the primary wound. There is very little inflammation after the primary wound. There is usually very little deformity in the bone itself. What happens? The physician attempts to reduce it without an anesthetic, a thing which can rarely be done perfectly. Then because the reduction does not look perfect, a firm board splint is put on and an attempt made to squeeze those fragments into position. What happens? The board interferes with the circulation so grossly that ischemia of the soft tissues on the palmar surface of the arm is produced, leading in turn to replacement fibrosis with cicatricial contraction, from which the useless claw hand of Volkmann results. The ischemia may also involve the wrist-joint, including the periarticular structures, this alone being sufficient to produce more interference with the function of that wrist than the primary fracture itself. I appreciate that I have made a broad statement and one that is open to criticism, but it is based on an experience with a large number of cases spread over a long period of years, mostly in the Cook County Hospital. A board splint should never be used except as a temporary means of immobilization while transporting the patient. It has no place in the treatment of fractures. A board splint cannot be padded. I make this as a broad positive statement. A board splint cannot be padded so that it will fit the conformation of the part in such a way as to hold the fragments and at the same time not produce pressure enough to interfere with the circulation. When a bone is healing, what is the most important factor in the union of that bone? What are you trying to obtain? A good circulation. Can you obtain that when you are compressing the lymphatics? No. Are the lymphatics important factors in the nutrition of bone? Yes, very important. Does the splint interfere necessarily with the deep blood circulation? Possibly not, but it does interfere with the lymphatic circulation, and interference with the lymphatic circulation interferes with the nutrition just as much as interference with the blood circulation. Why? Because interference with the lymphatic circulation blocks the return circulation from the capillaries. The swelling that follows the manipulation incident to the fracture and its reduction makes the board splint fit more tightly, and the more tightly it fits, the greater becomes the circulatory obstruction, thus producing a true vicious cycle.

This man has a fracture. The picture shows a healed fracture in the lower end of the ulna and a healed fracture in the lower end of the humerus. Both have healed without deformity, and the patient comes to us now complaining of his inability to extend his hand and fingers and to supinate the forearm. In other words, we present here a case of wrist-drop complicating a fracture of the humerus. We have endeavored to elicit sensation in the forearm, but we are not able to do so. What was the nerve injured. The musculospiral—that is, with a drop-wrist and inability to extend the fingers we first think of musculospiral palsy. Usually when the musculospiral is caught, the ability to supinate remains because the nerve-supply of the supinator longus comes off above the point of fracture. If we examine further in this particular case, however, we must conclude that we have more than an injury to the musculospiral nerve with a drop-wrist. We have an injury to all the brachial cords. Why? This man has no sensation that we are able to elicit in the hand and forearm. There is complete sensory paralysis until we come to the region supplied by the circumflex. Where is our injury—at the site of fracture? No. This man must have sustained, at the time of the accident, an injury to the brachial plexus. He was struck by an automobile, so that the injury was, in all probability, violent and severe. What probably happened was that the head of the humerus was temporarily displaced from the glenoid cavity and crushed the cords of the brachial plexus. To what extent they are crushed, whether they are completely lacerated or whether there is a compression from which he can recover, I think remains to be seen. It is about ten weeks since this happened. Is ten weeks long enough to be sure that the brachial plexus was lacerated? The fact that the man complains of much pain when the fingers are straightened makes me think that the brachial plexus was not completely cut, and suggests that recovery is possible and probable. I would not recommend exploratory operation here until two months more of observation without improvement have passed.

CASE IV. FRACTURE OF FIBULA

Here is a patient in whom we are going to assume something without an x-ray picture. This patient was injured two weeks ago. He came to the hospital yesterday. He has had x-rays taken, the results of which we do not know as yet. I will make the diagnosis of fracture of the fibula. Many times I have made a diagnosis of a strain in the hip in old people and in a week or ten days gone around and found the buttocks and upper thigh showing this sort of ecchymoses, not superficial ecchymoses, but deep ecchymoses. We rarely see an ecchymosis of this sort present without a fracture, so I am willing to assume that this is a fracture. I believe this is a fracture and I want to show it because it does show this much ecchymosis. I want to say just a word about the superficial bleb that so frequently accompanies fracture. I have made this observation, that the most marked blebs are in fractures due to indirect violence and that they are more marked when there is extensive overriding of the fragments. From this observation I have deduced that the mechanism of bleb production in fractures is as follows: The superficial epithelium slides on the deeper skin structures and allows the accumulation of lymph or serum in the space between.

CASE V. FRACTURE-DISLOCATION OF THE ELBOW

This patient shows another uncommon condition that we did not consider in our discussion of the general principles of fractures. Here is a fracture-dislocation, a fracture into a joint, in this case a fracture into the elbow-joint. This occurred two months ago. You will notice that there is a fracture not only of the humerus, but of the radius and ulna. Notice that in the x-ray picture the olecranon is back of its normal position, that the olecranon does not rest in the olecranon fossa, and that there is, therefore, a distinct backward dislocation. In the face of the extensive disorganization of this joint let me call your attention to the amount of motion which it permits. The patient brings it pretty nearly to a right angle, and I think in time will get it to a little more than a right angle, and is able to extend the joint almost to the normal degree—a functional recovery almost beyond belief in view of the demonstrable anatomic changes. This brings up the great question of results in fractures.

Results in fractures are of two kinds—functional and anatomic. The anatomic result you estimate from the *x*-ray picture. When I first left the County Hospital as an intern I knew all about fractures. I had had a hospital service with a large number of fractures. I had treated a large number of fractures and was very proud of my results. My self-conceit never has received such a marked shock as it did with the introduction of the *x*-ray apparatus. I gathered up some of my old fractures that I was proud of and took pictures, and when I got through with the first ten or fifteen I almost stopped treating fractures. Yet every one of those fractures had good functional results. In other words, complete restoration of anatomic form is rarely necessary and is usually impossible. If the ends of the bone are in contact for one-third of their diameter, or sometimes even less, and the alignment, particularly in weight-bearing bones, is good, satisfactory functional results are almost certain.

How shall we dress this disorganized joint? In the older text-books there used to be definite rules laid down for the way to put up the various fractures around the elbow-joint, and obviously fractures around the elbow-joint are numerous. Fractures may occur through the humerus, through either one of the condyles, or through both, through the olecranon, and what not. We used to put up some in semiflexion, some in extension, some in pronation, others in supination, and others half-way between pronation and supination. I think it is erroneous in the treatment of fractures around the elbow-joint to follow any of those rules, and I will tell you why. I think even with a good *x*-ray that shows you the extent of the fracture, that you cannot estimate in any way whatever the amount of laceration of the ligaments. I feel you cannot tell accurately what effect the position of the arm in relation to flexion and extension will have on the fragments, whether it will throw them backward or forward. There is but one accurate and definite way of getting at it, and that is to reduce that fracture and to fix that fracture in front of the fluoroscope. I am coming to believe that I cannot tell in what position I should put the arm to get the best apposition of the fragments without a fluoroscope. The fracture should be reduced before a fluoroscope and it should be put up before a fluoroscope.

Passive motion and massage should be given early in this class of cases. Massage helps the lymphatic circulation and reduces the tendency to fibrosis. Passive motion prevents new adhesions and stretches or breaks those which have already formed. Together, these two measures are of prime importance in preventing ankylosis and preserving the greatest degree of mobility at the joint. Let me again call to your attention the good functional result this patient has in spite of the bad anatomic result.

CASE VI. COMPOUND FRACTURE OF FEMUR

This boy has a peculiar injury. He gives a history of having had twelve operations for osteomyelitis of the femur. About seven weeks ago he came into the hospital with a fracture at the site of the old operative wound. There was unquestionably some rarefaction of this bone. This was in a sense a pathologic fracture. This boy had the end of the femur sticking through the skin. It has been reduced, but there is still some little malposition. The wound is badly infected and it is a difficult thing to know just how to treat the condition. It is apparent that an open operation will be advisable if we are to obtain the necessary reduction of the fracture. On the other hand, it is obvious that one cannot, in the presence of this active suppuration, go in and try to put the ends of the bone in apposition and fix them by mechanical means. I feel, therefore, that the best thing to do is to wait until the suppuration ceases and then to correct any important deformity.

It may not be amiss here to say a word about the treatment of suppurating wounds. The other night Dr. Richter presented his slides before the Chicago Surgical Society and talked about his experience in the war zone. In the treatment of suppurating wounds he tried out a variety of irrigating solutions, among them being Dakin's solution, a mild iodid solution, carbolic acid solution, and plain water. From this experience he concluded that it did not matter what solution you used, it did not matter if you did not use any solution, provided you had sufficient drainage. Free drainage is the all-important principle in the treatment of suppurating wounds. Dr. Richter described 2 cases for illustration. Two men came in on the same day in the same ambulance. In one the whole olecranon and lower end of the humerus had been blown off and the joint was wide open. In the other a shell fragment had entered the soft tissues, producing a puncture wound. The first man was up and about in two or three days with a perfectly healthy wound that healed up promptly. The other man grew worse. There was wide destruction of bone and wide destruction of the soft tissues, and the man was still in the hospital when Dr. Richter left. Had this wound been opened widely immediately it would have healed just as kindly as the other did. Dr. Richter felt that where he left the wounds wide open he always got good results. He was also sure that he got bad results where drainage was insufficient, no matter what else was done. The last word in the treatment of suppurating wounds is, therefore, drainage, and we are treating this boy accordingly.

CASE VII. FRACTURE OF FIBULA

This woman fell and hurt herself the day before yesterday. The first question that presents here is that of diagnosis. An *x*-ray picture has been taken, but no report has as yet been made. The intern tells me that they believe this to be a fracture of the lower end of the fibula with some injury of the tibia or of the internal lateral ligament, and with some dislocation of the foot toward the fibular side.

I present this case for the purpose of bringing out a few general principles concerning the treatment of fractures. You will agree with me that a fracture-box, even though well padded, is not as soft as a bed would be. As that foot rests in the fracture-box, where is the pressure? Over the os calcis. Over the heel. If there is one complication that men of experience dread in these fractures around the ankle-joint more than any other it is the necrosis that so often occurs over the os calcis. This is one of the best methods of producing necrosis over the os calcis. Now what does that fracture-box do? Nothing but furnish a hard board for that soft leg to lie on, nothing else. Does it reduce those fragments? No. Does it help the swelling which appears? No. Does it in any way help to hold those fragments in position? No. There happens to be no pressure necrosis in this case. That padding was put in last night to protect the heel, but it will not protect it long. Some day I am going to come over here, build a bonfire, and burn up all these fracture-boxes, if it takes all day to do it. That is the only way we will ever get rid of them. There is one way of making a splint, if you are not lazy, and that is to get two boards and a blanket. Roll the blanket on the splints, making a hammock splint. A blanket hammock will not interfere with the circulation of the superficial soft tissues—a most essential point in the treatment of fractures—and will provide quite efficient immobilization.

Now the question comes up: When will you reduce the fracture, if a reduction is necessary, and when will you put on a permanent splint? If the deformity is marked and you are sure you are dealing with a fracture around the ankle-joint with more or less dislocation, do not wait for the *x*-ray, give your patient an anesthetic unless there exists a marked contraindication, reduce the dislocation, and reduce the fracture as well as you can. Manipulate the fragments into apposition as accurately as you can, using the sense of touch as your guide, and then put on a molded plaster splint or a molded splint of some other firm material. That splint should never be a circular splint unless it is immediately cut. A circular plaster-of-Paris cast should never be placed on an acute fracture unless it is cut and spread, and should never be placed on the forearm without being split. A metal splint is much better. Never, under any circumstance, attempt to crowd the fragments of a fracture into position with the splint, no matter what kind of a splint it is. Never try to crowd the fragments into position by pressure over the soft parts. So long as a limb is absolutely quiet and is not subjected to the pulls of contracting muscles, trunk movements, and so on, a reduction, once accomplished, tends to persist. The function of a splint is to immobilize, to provide this absolute quiet. When one attempts more than this he is overstepping the limits of usefulness of the splint and making it an instrument of destruction.

CASE VIII. FRACTURE OF THE FEMUR (INTRACAPSULAR)

I just want to show you this case because of the opportunity it gives me to speak of the general question of extension. This man has an intracapsular fracture. I am treating all my fractures of the humerus by extension for the first two weeks until they are solid, and I believe that until we have a better method we will have to treat the fractures of the femur by extension. All these fractures should be dressed in the abducted position and some means of preventing internal rotation provided. That can be done very readily by passing a number of strips of adhesive around the thigh and attaching them to a brick which is allowed to hang over the side of the bed. The Bardenheuer extension, I think, interferes too much with the circulation. In any form of extension, remember, we have to contend with this.

A word about putting on adhesive. I believe adhesive strips should be put on from the knee to the hip and should extend over the fragments, so that when traction is made on the strips, all the muscles and all the fascia from the knee to the hip will be under tension, and then the fragments will be pulled into place. Just one other statement: As my experience with the Steinman method of extension increases I am coming to believe that it is the best method so far devised. I do not believe that the old Buck's extension is sufficient to overcome the strong muscles of the femur. By the Steinman method a nail is driven through the os calcis or the lower end of the femur (see Figs. 491, 492), and extension is obtained by attaching the familiar weight-and-pulley device of Buck to it. As my experience increases I am growing more and more fond of this procedure.

CLINIC OF DR. PHILIP H. KREUSCHER

MERCY HOSPITAL

HYPERTROPHIC VILLOUS SYNOVITIS OF THE KNEE-JOINT

Summary: An infectious disease secondary to infectious processes elsewhere in the body characterized by a relatively acute onset followed by gradual enlargement of the joint associated with moderate but fairly constant pain and increasing disability; pathologic anatomy—bone never involved; differential diagnosis—rheumatoid arthritis, Charcot joint, tuberculosis, sarcoma; treatment.

A LESION which frequently is not diagnosed and which is often mistaken and treated for tuberculosis is that which we now know to be a hypertrophic synovitis involving the villi of the knee-joint. I wish to present the histories of three advanced cases of this disease.

CASE I.—Patient a male, aged thirty-six, who at the age of thirty noticed a small olive-shaped protrusion in the right popliteal space. This was taken to be a cyst and was removed without much difficulty. About a year later he developed multiple arthritis and synovitis involving the elbows, the right shoulder, and both knees. There was no acute incapacity, but after a long walk he would notice a swelling in both knees lateral to the patellar ligament. This swelling would subside after some hours of rest, but would again appear after the patient took prolonged exercise, such as walking or running. This swelling increased, and the patient, who was a physician, noticed that in place of the fluctuating tumor which was present on either side of the patellar ligament, the masses were becoming boggy and not as painful as previously.

When he presented himself for treatment both knees were markedly swollen; there was comparatively little acute pain, but always a dull ache and stiffness of the joints after rest. The tuberculin and Wassermann tests were negative. He gave no history of previous throat or sinus infection. He had, however, for quite a number of years had considerable trouble with his teeth. *x*-Ray examination of the teeth showed ancient abscesses at the roots of several of them and numerous pyorrheal pockets. He had had autogenous vaccines prepared, but they were taken with very little benefit. The patient presented himself in Dr. Murphy's clinic in April, 1915. Dr. Murphy performed a complete synovial capsulectomy of the right knee-joint.

In October, 1916, he came into my clinic. His right knee was almost normal in size, freely movable, and painless. The left knee, however, had become quite as large as the right knee was before operation. Upon examination it was found that the condition existed there the same as it had in the right knee. A complete synovial capsulectomy was performed October 14, 1916.

CASE II.—A female, aged thirty-two, came to the hospital on account of multiple metastatic arthritis involving the fingers, elbows, ankles, and the left knee. A careful clinical history revealed that the patient had had repeated attacks of tonsillitis and infection of the frontal sinuses. Upon examination it was found that the left knee was enlarged, especially laterally and in the popliteal space. The masses did not fluctuate, but had that boggy sensation typical of villous hypertrophy. Aspiration of the joint gave us a very small quantity of serous fluid, but did not reduce the swelling about the knee-joint. The *x*-ray picture showed no bone destruction and no changes in the bone ends. A diagnosis of hypertrophic synovitis was made and the patient was operated on December 22, 1916.

CASE III.—A female, aged fifty-two, presented herself at the hospital with multiple arthritis originating from infected teeth and involving the right knee-joint and the ankle- and elbow-joints. The right knee-joint was very much enlarged, but had those typical oval masses protruding from the joint cavity on either side of the patella. On the inner side of the quadriceps tendon a long sausage-shaped mass extended upward a distance of about 3 inches. There was very little acute pain, but a constant dull ache and stiffness of the knee-joint. This condition had existed for a period of nine months and had entirely incapacitated the patient. The most comfortable position of the limb was that of slight flexion, which accounted for her inability to straighten the knee completely. As in the preceding cases, the *x*-ray picture showed no bone involvement. The aspirated fluid was serosanguineous, probably due to the fact that she had been walking a great deal just preceding the aspiration.

The foregoing histories show three types of a well-defined condition found in the advanced stages of hypertrophic villous synovitis. In each of them we have a period in the early course of the disease which must be recognized as an acute synovitis. This acute synovitis became chronic with or without enlargement of the joint, and finally we have the late pictures of enlarged joints with large masses protruding from either side of the patella and quadriceps tendon with a rather less prominent patella. One of them had considerable lateral bulging, especially on the inner side, while another had a marked protrusion posteriorly into the popliteal space. I have no doubt that the small mass which protruded into the popliteal space in Case I was a protrusion of a portion of the synovial sac rather than a cyst.

All the older writers recognized the fact that cases of villous synovitis were but the late stages of an acute or chronic synovial involvement. They all agreed that loose semilunar cartilages, rice bodies in the knee-joint, genu valgum and pes planus, and the so-called rheumatoid arthritis were the principal causes of this disease. Even Tubby, in his latest work on bones and joints, had not fully grasped the fact that nearly all these cases are of bacterial origin when he said that "the possibility of a septic arthritis of a mild type must not be forgotten."

From our more recent clinical and experimental studies of synovitis and arthritis we find that practically all of them are metastatic from some focus of infection. By a metastatic infection we mean one that is due to organisms which are active and are capable of multiplying within the tissues of the host, and eventually attack similar or susceptible tissues in some distant part of the body. In my recent analysis of nearly 1000 cases of arthritis and synovitis I found that 25 per cent. were due to infected tonsils, 18 per cent. to infected teeth and alveolar processes, 17 per cent. were due to infected sinuses and antrums, 17 per cent. to Neisserian infection, and the remaining, 23 per cent. were caused by infections of the genito-urinary tract, gall-bladder, typhoid fever, dysentery, scarlet fever, etc. I have under my care at the present time a case of synovitis which developed during the third day of an attack of smallpox, and another case upon which I have recently performed an arthroplasty in which the infection in the knee began during the course of an attack of scarlet fever. We believe that the foreign bodies and the irritations in the joints due to deformities of the extremities are causative only inasmuch as they traumatize the synovial membrane and make it more susceptible for invasion by pathogenic organisms. We believe, furthermore, that when the knee-joint has in it loose cartilages or other bodies, the pathologic changes may be greatly exaggerated because of the irritation of these foreign bodies. It is our opinion, however, that the foreign bodies alone are not primarily causative of the condition under discussion.

The pathologic changes which take place in these joints and which distinguish this type from the ordinary chronic synovitis is the overgrowth of the synovial membrane and synovial fringes, so that they frequently become elongated pads of tissue, or even pedunculated masses (Fig. 485). Very frequently such a mass becomes detached from its base and forms a type of loose body in the joint. These pathologic changes have as their origin: first, irritation from the invading organisms; second, the repeated traumatizations which occur during active use of the limb. It must be remembered that during the progress of this disease the causative organisms continue their work in the subsynovial spaces where they have been deposited. If it were possible to arrest this infection in the early stages I believe the joints would get well in spite of the subsequent mechanical irritation. In the course of this trouble all or at least a large portion of the synovial tissue is involved and destroyed, so that when one opens the joint you see a large, irregular, ill-defined mass of hypertrophic villous tissue, as shown in Fig. 403. Very rarely is there any normal synovial membrane in these advanced cases. The synovial pouch which extends upward, laterally, and behind the patella and quadriceps tendon becomes filled with this villous tissue. The cartilage covering the ends of the bone and the under surface of the patella becomes involved secondarily and probably

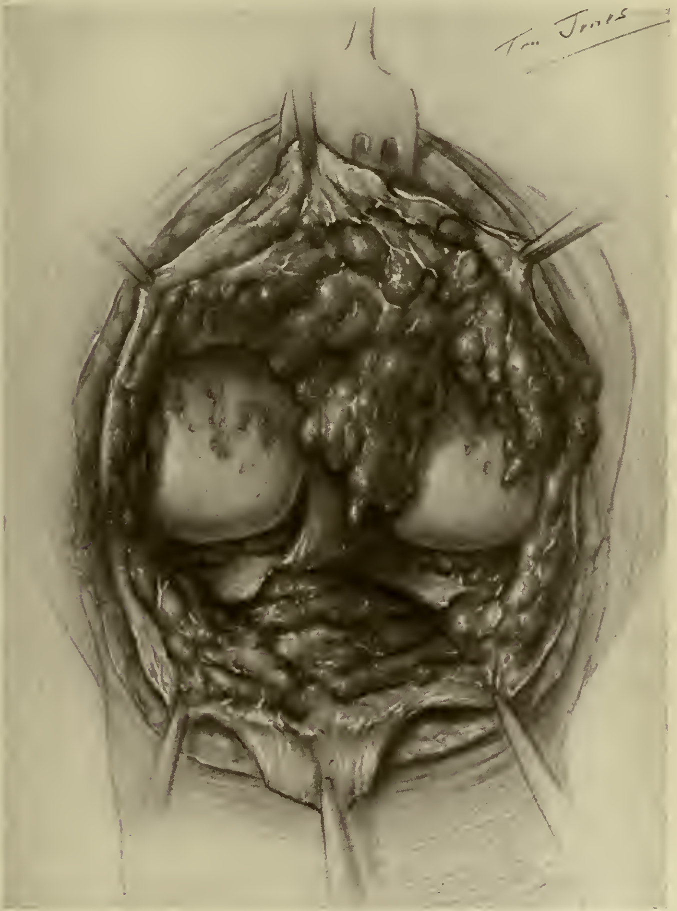


Fig. 485.—Drawing of interior of flexed knee-joint of Case No. III showing the large pads and pedunculated masses of synovial tissue. The articular surface of the tibia is almost entirely covered by villous projections. Note erosion of cartilage on condyles of femur. (Sketch made at operating table.)

only because of the bruising from the pedunculated villi and the loose foreign bodies. The semilunar cartilages which also become involved secondarily may become fragmented and frequently are entirely destroyed as was true in Case III. I have seen the crucial ligaments partially destroyed, but have never seen any involvement of the bone.

The symptoms which are present in these cases are very much less severe than one would expect. Very frequently the patient complains only of a burning or a dull ache in the joint, the sharp pain being present only after long-continued traumatization or when a loose body becomes pinched between the bone ends. The joint feels full and stiff when the patient gets up and about after a period of rest.

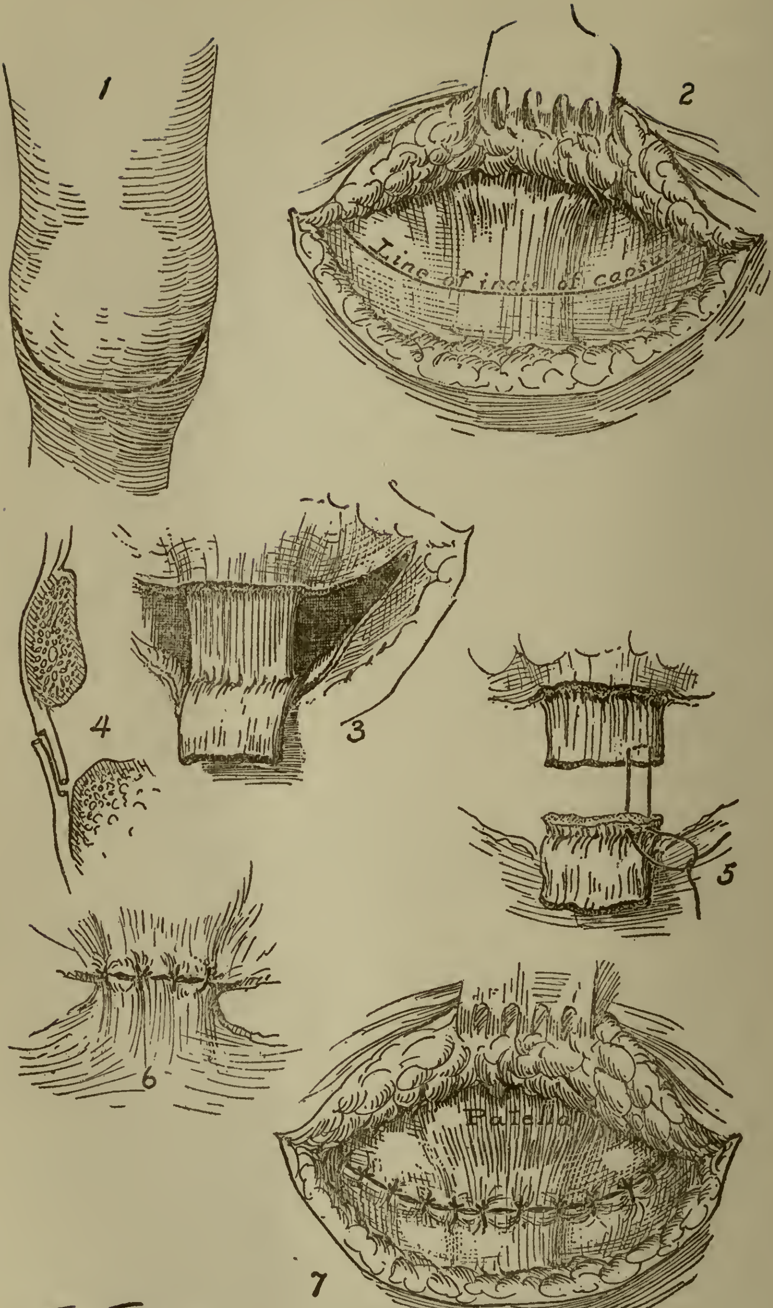
In the diagnosis one must think of the ordinary chronic synovitis, rheumatoid arthritis, Charcot joint, tuberculosis, and sarcoma. The cardinal diagnostic points are: first, the gradually developing enlargement of the joint; second, the absence of severe acute pain in striking contrast with what one would expect in such an enlarged joint; third, the presence of the large, oval, boggy masses which appear on either side of the patella; fourth, upon pressure downward from above the patellar ballottement, which is always present in the simple serous synovitis, is absent in these cases; fifth, aspiration of the joint even with a large needle or trocar yields very little fluid or frequently none at all; sixth, *x*-ray examination shows no involvement of the bone, which is in striking contrast with the Charcot and tuberculous joints.

The Wassermann and tuberculin tests must always be done. The differentiation from tuberculosis is not very difficult, as the synovitis usually occurs in cases where there is a multiple metastatic joint involvement.

In the light of our present knowledge of the etiology and pathologic changes which take place in this type of synovitis the treatment as recommended by the older writers does not seem adequate. How strapping and binding of the joints and mild counterirritation of the skin overlying these joints can benefit the condition is hardly conceivable. Even the injection of strong antiseptics, such as formalin in glycerin, are of very little benefit except in the very early stage.

The management of this lesion in the early stage involves the removal of the infectious foci which are causative. Infected tonsils must be removed, diseased teeth extracted, and suppurative antrums and sinuses drained. In short, *every possible source of infection must be removed.* That is the first step. The second important part of the management is absolute rest of the limb. A Buck's extension with sufficient weight to overcome the intra-articular pressure must be applied. Hot Epsom salts fomentations when continued over a sufficiently long period of time will relieve the local edema and hydrops. In this early stage the injection of formalin and glycerin solution is beneficial. The administration of bacterial vaccines made from the organisms which are causative of this lesion must be administered, but it is necessary to give sufficiently large doses to get a good constitutional reaction. The above outlined procedure must be continued for months rather than weeks if we desire to give our patient real benefit. If he presents himself for treatment in the advanced stage with all the cardinal signs and symptoms, then there is only one course to follow, namely, complete synovial capsulectomy.

The preparation of the operative field for such an operation is exactly the same as for an arthroplasty. The skin is shaved and treated copiously with alcohol and ether the day before the operation. Just preceding the operation the skin is again cleansed thoroughly with alcohol and ether. The application about the thigh of an efficacious tourniquet is quite necessary, as in this way we can work in a comparatively bloodless field. The operation throughout is performed without hand contacting. *Every effort must be made to avoid infection, as infection following such a procedure where all the tissues are bare and all the coffer-damming has been removed, would be disastrous to the joint if not fatal to the patient.* The U-shaped incision, as shown in Fig. 486, 1, is made through the skin and fat down to the fibrous capsule of the joint. The skin is retracted and dissected upward for about 1½ inches. A second U-shaped incision is then made about ⅔ inch above the skin incision (Fig. 486, 2). This divides the fibrous capsule and opens the joint. By making the incisions



Tom Jones

Fig. 486.

this way we do not have them both lying on the same plane, and we have an obvious advantage over the older methods. The ligamentum patellæ is divided as shown in Fig. 486, 3 and 4, first cutting transversely across the ligament and half-way through it, then stripping down the fibers longitudinally for about $\frac{3}{4}$ inch, and finally cutting the posterior half of the ligamentum patellæ transversely. This gives us an overlying flap in the reunion of the ligamentum patellæ and gives us an early firm union. This procedure has a decided advantage in that the patella itself is not divided. Now, the patella together with the entire fibrous capsule, in fact, the entire U-shaped flap, is retracted upward, and we have a complete exposure of the entire joint, as shown in Fig. 485. The knee is fully flexed and a resection is made of all the villous tissue, removing the entire synovial capsule if necessary. All the diseased tissue underneath the patella and in the pouches extending upward lateral to the quadriceps tendon must also be removed. If the semilunar cartilages are fragmented or loosened or in any way diseased, they too are taken out. In Case III the semilunar cartilages had been totally destroyed by the disease. After having removed all this tissue, and after seeing the erosion of the cartilage covering the surface of the bone, one cannot conceive of anything but an ultimate ankylosis. On the contrary, all these joints have been movable and serviceably sound without the interposition of a flap. An important point in the procedure is to bring about complete hemostasis after the tourniquet has been removed. If this is not done, we frequently have the formation of a large hematoma in the knee-joint, which always retards healing and which may prove disastrous if it becomes infected. A large hematoma under ten-

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Fig. 486.—1, Line of skin incision. Note enlargement of joint. 2, Retraction of skin and fat. Note line of incision through fibrous capsule; this incision lies about $\frac{2}{3}$ inch above the level of skin incision. 3, Incision through capsule and one-half of ligamentum patellæ. The longitudinal fibers in the anterior half of the patellar ligament have been stripped down to point where posterior half of ligament is about to be divided (author's method). 4, Semidiagrammatic representation of lateral view of patellar ligament after division. 5 and 6, Repair of ligamentum patellæ; method of application of first mattress-suture and appearance after repair is completed. 7, Complete closure of fibrous capsule.

sion may cause considerable temperature without itself being at all infectious. I have seen temperatures of 104° to 105° F. due entirely to hematoma. The temperature subsides after aspiration.

The patellar tendon is reunited, the fibrous capsule closed, and the skin-flap sutured without drainage. The patient is placed in bed with the limb in a straight wire cage and with an extension of from 12 to 15 pounds. Active manipulation must not be undertaken until after three and a half or four weeks. This permits sufficient time to elapse for the patellar tendon to reunite firmly and for the fibrous capsule to become organized. Active and passive motion together with massage are advantageous and necessary to re-establish the flexion in such a joint.

The patient whose history was cited under Case I is a practising physician, walks without crutch or cane, and a month ago, when I last saw him, walked without any pain or limp, and could flex both knees to a right angle with the thigh. Case II has a 45 degree flexion, can make complete extension, and puts the full weight on her limb without pain. Case III was operated on about eight weeks ago and is just now permitted to put some weight on the knee.

CLINIC OF DR. FREDERICK G. DYAS

Cook County Hospital

TREATMENT OF CARCINOMA OF TONGUE WITH RADIUM

Summary: Method of application; clinical course of case during treatment; necessity for surgical removal of cervical lymph-nodes; coincidence of acid reaction of buccal secretions and oral cancer; advantages of radium therapy.

This patient is fifty-three years of age, a bachelor, and by occupation a newspaper editor. One year ago he noticed a slight swelling on the under surface of the left side of the tongue opposite the first molar tooth, which was carious. He paid no attention to the swelling for six months, at the end of which time it began to increase in size. One month later he consulted a physician, who made a diagnosis of epithelioma of the tongue (Fig. 487). The physician told him that he might have his choice between excision of one-half of the tongue or treatment by radium. The patient was referred to me with this statement from his physician. I strongly advocated the radium treatment and also had the carious tooth at the site of the lesion extracted.

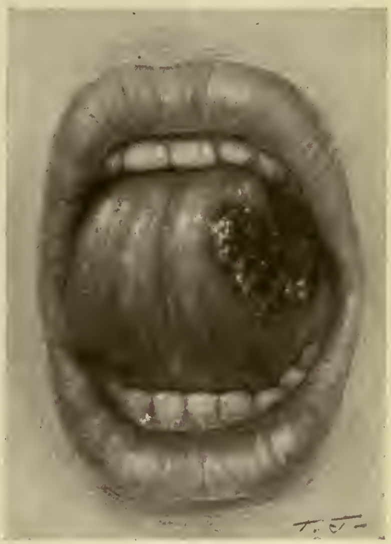

Fig. 487.—Carcinoma of under surface of left side of tongue before treatment. The radium needles were buried in the lesion, thus producing the so-called cross-fire.

On May 18, 1917, two hollow gold needles, each containing 35 mg. of radium, were buried in the lesion of the tongue and allowed to remain six hours. At the same time the cervical glands upon the same side were exposed to intensive radium application for six hours, and upon the following day for eight hours. The needles were secured in the tongue by heavy linen threads passed through the eyes of the needles.

The patient complained of no pain after the needles were inserted. He was allowed to go home after the treatment, and returned one week later. At that time there was very evident shrinking of the epithelioma, which had ceased to bleed and which was losing its cauliflower-like appearance. Two weeks from the first application the needles were again inserted in the lesion for the same length of time as previously and the same exposure was given to the cervical glands. One week later the patient presented himself with the epithelioma fast disappearing, it at that time being less than one-fourth of its original size, but there were two palpable cervical glands. The intense exposure to radium had caused a slight burn of the skin of the neck. Notwithstanding this, there had been no diminution in the size of the cervical glands, while in the tongue, where the radium had been buried in the lesion itself, there was a most marked improvement. Radical removal of the cervical glands was advised and accepted by the patient.

This was done by the Fenger method, making the incision from the tip of the mastoid process of the temporal bone downward along the posterior border of the sternomastoid muscle to the sternoclavicular articulation. This incision went through the skin and the platysma. The dissection was carried from below upward between the sternal and clavicular heads of the sternomastoid muscle. The spinal accessory nerve was identified at the point from which it emerges from the middle of the posterior border of the sternomastoid muscle and was carefully preserved. The jugular vein was exposed throughout its entire extent and a number of glands were found adherent to it. These were removed by careful dissection and both the anterior and posterior triangles of the neck entirely cleared of fat and glands. The incision was closed by a running catgut suture for the fascia and platysma and a black wax silk continuous suture for the skin. No drain was inserted.

The wound healed kindly in spite of the radium burn, much to my surprise. The patient is to have one more insertion of the radium in the tongue, which I believe will entirely clear up the small area which is left.

In this connection I would like to mention the law formulated by Dr. Charles Mayo and published in the Mayo Clinics for 1915, Volume I, to the effect that in malignant lesions of the oral cavity the normal alkaline reaction is always found to be changed to acid. This acid reaction seems to precede the development of carcinoma. Infections of the oral cavity, such as pyorrhea alveolaris, osteomyelitis of the maxillæ, chronic tonsillitis, tertiary specific lesions, and general unhygienic conditions of the oral cavity tend to produce an acid medium. In corroboration of his statement Dr. Mayo cites the instance of carcinoma throughout the gastro-intestinal tract, pointing out the frequency of malignancy within the oral cavity. It is comparatively rare through the esophagus and it is a common occurrence in the stomach, which is acid, and its maximum occurrence is at the point of the stomach which is most highly acid, namely, the pylorus. Passing on into the duodenum and small bowel the incidence of carcinoma is relatively very rare until the lower portion of the large bowel is encountered, when carcinoma again increases in frequency. It is relatively common in the rectum. So far as the literature gives us any information, the incidence of an acid medium in other locations of malignancy has not been worked out. The point for us to remember, however, is the necessity of impressing upon our patients the danger of allowing infections of the oral cavity to go without proper management and to institute care of the hygiene of the mouth in every particular.

It may be argued that one successful case of the treatment of carcinoma of the tongue by radium is a small argument in favor of the continuation of this treatment. However, when the safety and comfort of this procedure are contrasted with the mutilating and ineffective resection of one-half of the tongue, as formerly practised, it seems to me that every surgeon should give the radium treatment a thorough trial before resorting to the tongue resection. It seems possible in most early surface epitheliomata to bring about a cure of the lesion by the implantation of radium. Whether or not this will control the metastases depends upon the date at which the radium treatment has been instituted. However, in the case of the mouth, even though the patient cannot be fully cured, he will have preserved to him a clean, painless tongue which will enable him to eat and talk for a considerable period without distress. The advantages of this method of treatment I think are sufficiently clear to justify its adoption in the treatment of every case of carcinoma of the tongue.

OLD FRACTURE OF PATELLA

Summary: History—fracture resulting from a fall; repair and refracture after three months on attempted passive motion; examination disclosing wide separation of fragments; technic—lengthening the quadriceps tendon; post-operative management.

This case represents some of the difficulties encountered in the repair of old fractures the fragments of which have become separated by contracture of the muscles during a considerable period of time.

In June, 1916, this patient fell, sustaining a transverse fracture of his left patella, dividing the bone so that three-fourths of the patella was included in the large upper fragment and one-fourth in the small lower fragment. He was operated on in June, 1916, and the patella was sutured with aluminum-bronze wire and the leg put up in extension by means of a plaster cast. The patient was kept in bed for three months, at the expiration of which time he apparently had union of the fragments and was able to walk with the aid of crutches. Later he was able to walk with the aid of a cane, but motion in the knee-joint was limited. In November, 1916, an attempt was made to break up the adhesions under anesthesia, and the patella was refractured, apparently in the old situation. Since that time he has been able to get around with the aid of a cane and a long bandage of elastic webbing applied to the knee-joint as a figure-of-8 bandage.

Examination on March 6, 1917, that is, day before yesterday, showed a separation of the fragments of about 3 inches. There was no evidence of active inflammation. The patellar fragments were freely movable, but the upper fragment could not be brought down nearer than 3 inches from the lower fragment. *x*-Ray examination confirmed the above findings and showed the remnants of the wire which had been used in the operation.

(Operation March 8th under ether anesthesia.) The patella was exposed through the old incision. An enormous amount of dense connective tissue was found, and fragments of wire were removed. The two fragments of bone were freed as well as possible from the surrounding scar-tissue and an attempt to approximate the large upper fragment to the lower showed that a distance of 3 inches would have to be bridged over. In order to overcome this difficulty a longitudinal incision was made extending up the thigh for about two-thirds of its length. The quadriceps extensor tendon was exposed and separated by a long V-shaped incision through the whole thickness of the tendon. This allowed the upper fragment to be brought down to within ½ inch of the lower fragment. We now observed that there were dense connective-tissue adhesions upon the under surface of the patella binding it to the subjacent bone. Upon freeing these it was possible to bring the fragments together without tension.

The fractured surfaces were now freshened and the fragments held in apposition by means of two strong kangaroo tendon sutures inserted in the form of mattress-sutures from below upward through the periosteum and fibrous capsule of the patella. Other kangroo tendon sutures were introduced in a similar manner, coming through the quadriceps extensor, encircling the two fragments, and emerging through the ligamentum patellæ, one being introduced from the outer side and one from the inner side as purse-string sutures. Finally, another kangaroo tendon suture was introduced, after the manner of Stimson, in the middle of the ligamentum patellæ through the capsule of the joint, and then to the uppermost portion of the upper border of the patella, returning in the form of a mattress-suture. The edges of the capsule were now sutured together and the quadriceps extensor tendon repaired by uniting the V-shaped flap to the edges of the tendon which remained after the tenotomy. It would be possible to obtain further coaptation of the flaps without making any tension on the patellar sutures, and therein lies the vital consideration in the repair of fractured patellæ, namely, *the accurate coaptation of the freshened fractured surfaces without tension.*

After controlling hemorrhage and making the usual skin closure, a plaster cast was applied reaching from the perineum to the toes, with the foot at right angles to the leg and the leg in extension.

The following day the middle two-thirds of the cast was cut out in a longitudinal direction in order to prevent constriction of the blood-supply and to allow inspection of the wound. There was no oozing of blood, but there was considerable swelling of the limb as the result of the trauma. This subsided after four or five days and the wound healed by primary intention.

At the end of eight weeks the cast was removed and daily massage and passive motion instituted. There was firm union of the patella and about one-fourth the normal range of motion of the knee-joint. This was increased under the treatment of massage and passive motion, and the patient left for his home with instructions to carry out this treatment.

In effecting the mobilization of joints, the site of fibrous ankylosis following fracture, it is better to bring about motion by long-continued massage and passive motion than by a single forcible attempt to mobilize under an anesthetic. The method of elongating the quadriceps tendon is not original and may be found in certain works on surgical technic.

CLINIC OF DR. DANIEL N. EISENDRATH

Cook County Hospital

GUNSHOT WOUNDS OF THE FEMUR

Summary: Case I.—A compound, comminuted fracture of the lower end of the femur involving the knee-joint; conservative treatment with immobilization and extension the rule unless local or general signs of infection appear; indications for radical measures; experience of Groves and others in European military hospitals.

Case II.—A lesion similar to that in Case I in a patient with delirium tremens; result—mal-union with overriding and angularity which will require operative correction at a later date; injection of antitetanic serum a desirable prophylactic measure in every case of gunshot wound.

Case I.—This patient was admitted to the hospital five weeks ago, having been shot through the left femur by robbers. Examination shortly after admission showed a wound of entrance upon the outer aspect of the left thigh about 2 inches above the knee and a projection of the skin upon the inner aspect of the thigh, almost transversely across from the wound of entrance. This projection of the skin was due to the bullet, which was removed, shortly after the patient entered the hospital, under local anesthesia. The knee-joint, in general, showed considerable swelling, especially in the region of the suprapatellar bursa. The radiograph (Fig. 488), taken in an anteroposterior direction, showed an oblique fracture located at the junction of the lower and middle thirds of the left femur, with but slight lateral displacement of the fragments. The lateral view (Fig. 489) showed that the fracture was **V** shaped, with the upper fragment wedged in between the two large lateral fragments. In other words, we were dealing with a compound comminuted fracture of the lower end of the femur, the bullet having also passed through the knee-joint, as shown by an extensive swelling of the joint.

Measurement of the two limbs showed a shortening on the left (the injured) side of $1\frac{1}{4}$ inches.

Conservative treatment was decided upon after the removal of the bullet, and an aseptic dressing was placed over the wounds of entrance and exit (the latter where the bullet was removed), and an extension of 20 pounds was applied to the thigh, the knee being flexed almost at right angles and placed upon a double inclined plane splint made of $\frac{1}{4}$-inch iron tubing, as shown in Fig. 490. As a prophylactic measure 1500 units of tetanus

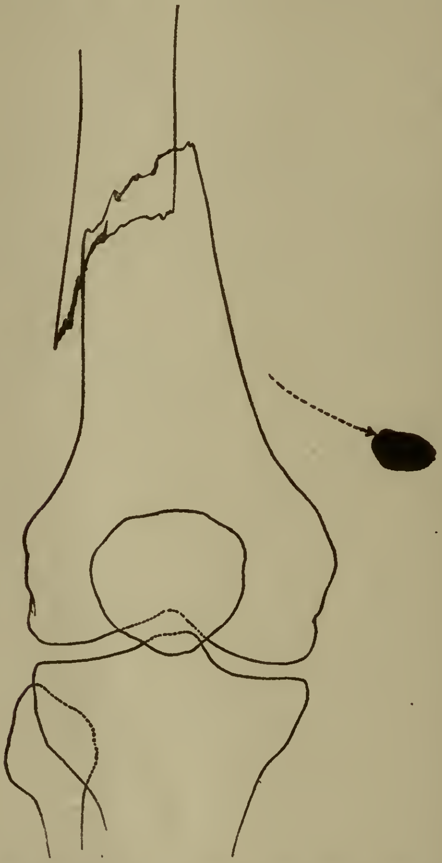

Fig. 488.—Tracing from *x*-ray plate of Case I, described in the text. Note position of bullet, well away from the bone (anteroposterior view).

antitoxin were given upon the day of admission to the hospital. No attempt was made to disinfect the vicinity of the wounds by any means other than that of painting the skin with pure tincture of iodin for a distance of 4 inches from each wound.

The patient's temperature has never risen much above normal during the past five weeks, and, as you will see by this examination, the result obtained is an endorsement of the conservative treatment which we have employed. Recent literature is full of references to the treatment of gunshot fractures of the long bones, and the general opinion is well summarized in a recent article by Groves,[1] who believes in immobilization in a

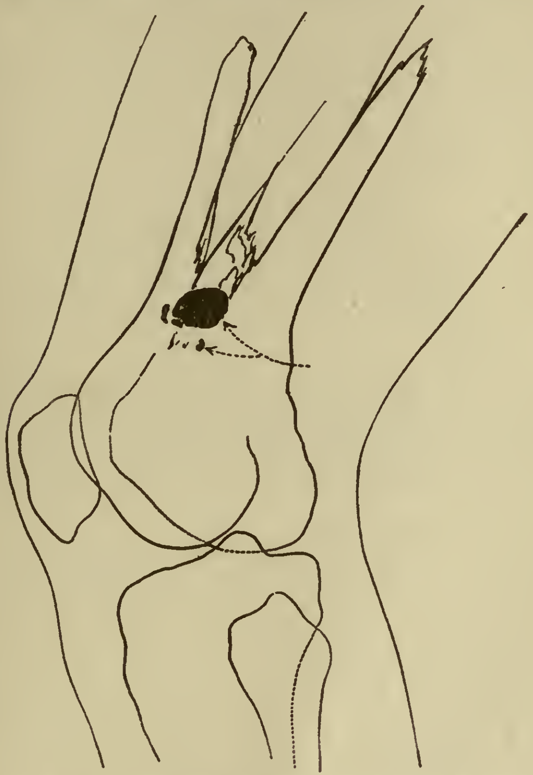

Fig. 489.—Tracing from x-ray plate of Case I, same lesion as shown in Fig. 488 (lateral view).

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[1] Brit. Jour. Sur., 1916, 3, 592.

metal splint and suspension of the limb, if it requires dressing and extension, for five or six weeks with the knee and hip flexed, and in the proposition of thorough wound drainage. In completely penetrating wounds, like the case shown you today, the conservative treatment, the fracture being regarded as not different from the ordinary compound fracture of civil practice, will bring the best results. In certain wounds with extensive tearing of the soft parts and lodgment of foreign bodies, the treatment must necessarily be a more radical one. If these cases are seen within twenty-four hours from the time of injury it is possible to operate upon them, but if not seen until later, disinfection of the wound is the only operation, and conservatism should be the rule unless local or general signs of infection

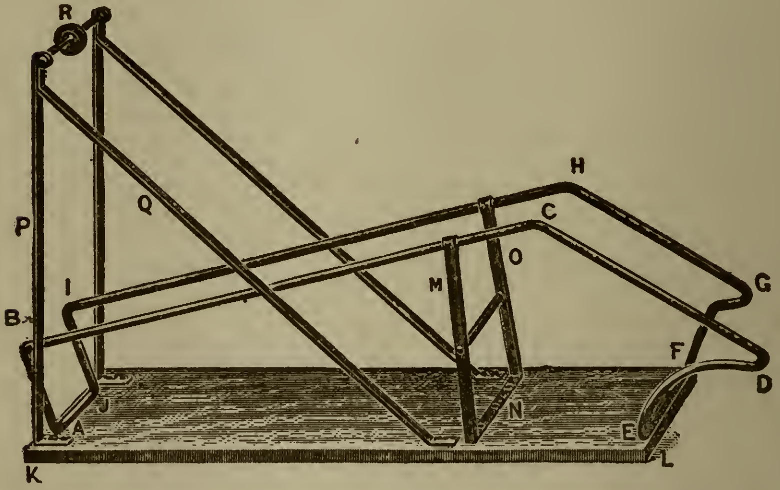

Fig. 490.—Groves' wire cradle leg splint for transport or extension. The splint is constructed of mild steel wire, $\frac{1}{4}$ inch thick, fixed on a board as shown. The two flat steel uprights bearing the pulley wheel can be screwed to the board if required, so that extension can be used without moving the limb from the sling splint. The model shown is for the left leg. The dimensions of this apparatus are as follows: *A–B*, *J–I* = 5 inches; *B–C*, *H–I* = 30 inches; *C–D* = 15 inches; *H–G* = 13 inches; *D–E* = $7\frac{1}{2}$ inches (cord of the arc); *E–F* = 10 inches; *C–H* = 8 inches; *B–I* = 5 inches; *P* = 22 inches; *Q* = 31 inches; *K–L*, board, 34 by 9 inches; *M–N–O*, flat steel support; *R*, pulley-wheel. The bend of the splint at *C* and *H* is 11 inches above the board.

appear. Fragments of bone should not be removed unless they are dead.

The best position for the limb is with the knee at an angle of 120 degrees and the hip flexed. A femur which requires 25 pounds in a straight position only needs 15 pounds when the knee and hip are flexed. Adhesive plaster should be applied to the thigh unless the wound be so extensive that this cannot be done. The transfixion of the femoral condyles, or at least the application of some method of extension, as first suggested by Steinman, and modified by Groves (Fig. 491), gives the best results where adhesive plaster cannot be applied for extension.

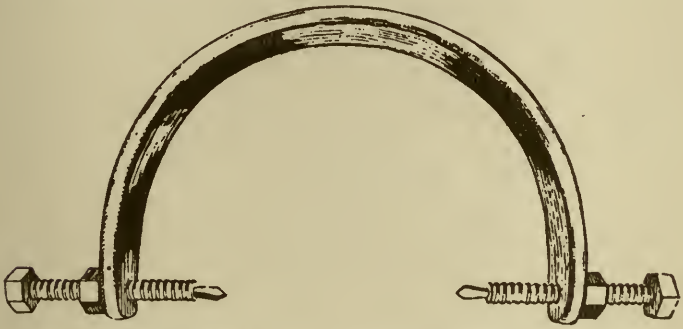

Fig. 491.—Groves' horsehoe clamp for use as a substitute for the Steinman pin. The clamp can be applied either to the condyles of the femur or to the head of the tibia. See text and Fig. 492 for description and illustration of the method of application.

This method is not without its dangers, as Groves, in the article just quoted, points out. In 2 out of 6 cases in which the Steinman pins had been used, the pinholes became septic and there was also suppuration in the knee-joint, which Groves thinks may have been due to the pins. This may be avoided either by waiting until the infection is overcome before the Steinman extension is applied or by using the head of the tibia, where no soft parts except the skin and fascia are involved. Sixteen pounds' traction does not do damage to the ligaments of the knee-joint. Movements of the muscles and joints, after the danger of wound infection has ceased and the leg is in good position in its sling, should be carried out daily, so that when the bone is firmly united the patient will be able to work. In the majority of cases the Steinman extension is applied within three days after the admission of the patient except where severe infection is present. Sixteen pounds is usually enough, and may be reduced by one-third in two weeks, the extension altogether being kept up for six weeks. If the infection tends to travel upward along the thigh, a special straight splint can be used. Groves' results have been most encouraging. He emphasized particularly the conclusion that ragged shell wounds with retained missiles must be opened early and freely, but that clean perforating wounds, as in the case I am showing you today, should be left alone. Between these two classes are a large number of cases in which the local evidences of infection and general symptoms, such as fever, leukocytosis, etc., are indications for immediate operation.

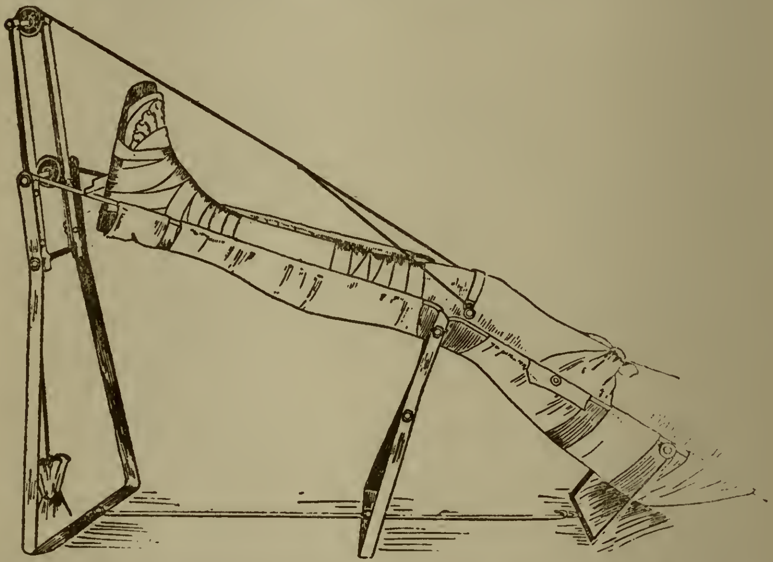

Fig. 492.—Extension by transfixion or horseshoe screw clamp, the leg being supported on the wire cradle splint of Groves.

Of 32 clean cases treated by Groves, only 2 did not give satisfactory results. Out of a total of 60 cases, 6 died—10 per cent. There was loss of the limb in 6.6 per cent.; good form and condition in the limb saved in 74 per cent.; delayed union in 16 per cent.; delayed healing in 6 per cent., and a limp in 4 per cent. Some of his conclusions are of great value in giving us a fairly good picture of the experiences gained in the treatment of gunshot wounds of the femur during the present war. These are as follows:

The limb should be immobilized at the earliest possible moment, and this immobilization should not interfere with frequent dressing. Immobilization is best carried out by a wire cradle sling splint (Fig. 492) constructed on the principle of the double inclined splint. When the wounds have been thoroughly opened and drained and have taken on a healthy character, the Steinman transfixion and extension treatment should be applied and maintained until union is firm. This is far more reliable than the use of adhesive plaster, but is attended by certain risks of septic infection of the soft tissues and particularly of the knee-joint, which I have referred to above. The comminution, apart from sepsis, is not a hindrance, but rather a stimulation to rapid union. The removal of pieces of comminuted bone is unwarranted and is a most potent cause of non-union. The position of flexion of the thigh involves the risk of pus being tracked up the limb, but this can be prevented by thoroughly opening the infected area, or if not, drainage must be kept up by the use of a splint which keeps the limb horizontal. I can most warmly recommend the articles by Groves, Bowlby, and Martin in the October, 1916, number of the British Journal of Surgery, and also the monograph by Groves on "Modern Methods of Treating Fractures," by William Wood & Co., 1916, to those interested in this subject.

Case II.—The second case is one of penetrating gunshot wound of the lower end of the femur quite similar to our first case, and is another example of bullet wounds of the extremities as we meet them in civil practice.

The first thing to consider in every case of gunshot wound, as I have previously explained, is the wound. If it is a penetrating wound, there is usually very little danger of infection, and the treatment of the fracture can be undertaken at a much earlier period, but if there is extensive destruction of the soft parts or the patient is not seen until the end of forty-eight hours, and there is extensive infection of the soft tissues in the vicinity of the point of fracture, the whole problem is one of combating the infection, and we are compelled to postpone active treatment of the fracture until the infection has been controlled.

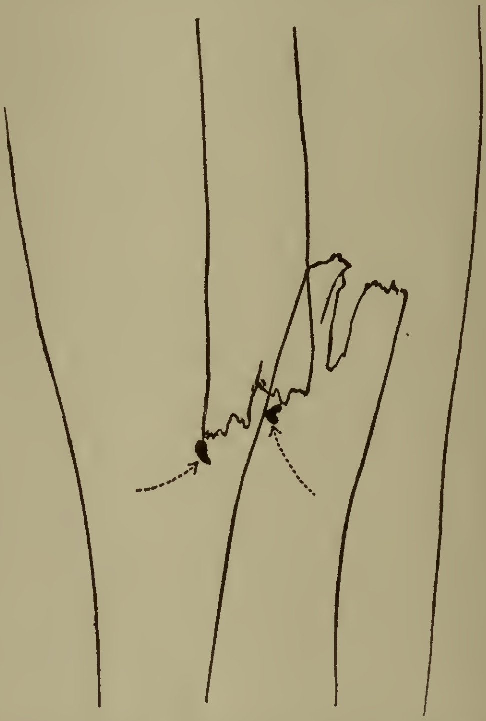

Fig. 493.—Tracing from *x*-ray plate of Case II, showing degree of angulation and overriding at point of fracture. Arrows indicate particles of lead from the bullet.

Our second patient has had delirium tremens and this has interfered greatly with the treatment of the gunshot fracture as it would ordinarily be carried out. The *x*-ray (Fig. 493) shows that the bullet has divided the lower end of the femur almost transversely. It was impossible to apply extension on account of this patient's condition, so that there has been malunion

(Fig. 493) at the point of fracture, with considerable overriding and angularity, which will require special treatment. It is too late for the application of the Steinman extension, and the only method of treatment which can be considered is that of operative correction of the malunion which must be done in the near future.

In considering the first case I can heartily recommend the position taken by Groves favoring extension in the majority of cases of fracture of the femur either by adhesive plaster or by the Steinman method of using pins, ice-tongs, etc. With the knee and thigh in a flexed position, the tendency for the powerful gastrocnemius muscle to pull the lower fragment downward and backward, so that it may impinge upon the vessels and cause thrombosis with resulting gangrene of the limb, is corrected.

One thing I would like to emphasize is, that in every case of gunshot wound it is best, as a matter of prophylaxis, to give a dose of antitetanic serum.

CLINIC OF DR. KELLOGG SPEED

Cook County Hospital

RIGHT UPPER QUADRANT APPENDICITIS

Summary: Fetal development, rotation and descent of colon; usual position of cecum and appendix; abnormal positions, especially right upper quadrant locations; symptoms of right upper quadrant appendicitis; diagnosis, direct and differential; observations on operative pathology in 3 cases.

We must turn our attention today to the ten-week-old human embryo. At this period the cecum, the part we are most interested in because of its relation to the appendix, lies close to the umbilicus. The small intestine occupies the right side of the abdominal cavity and the liver is so large that it reaches nearly to the pelvic brim. The colon and the small intestine cannot be differentiated in size; all the intestine has a common mesentery attaching it to the spine. Somewhat later the stomach, cecum, and small intestine develop and differentiate, and the intestine becomes fixed at its two extremities, one near the diaphragm and the other in the pelvis, and it elongates with the cecum, budding out near the pelvis beneath the liver. As the colon elongates it forms a curve with a convexity near the cardiac end of the stomach, and a slow differentiation into descending and transverse colon with a splenic flexure ensues. After the fourth fetal month the widely open umbilicus closes, the cecum moves inside the abdomen. The liver blocks its ascent, and yet its attachment to the small bowel determines that it shall pass around to the right and come to lie just caudal to the liver. The picture of the colon at this time shows the cecum near the large liver, high in the abdomen, extending ventral to the duodenum to form transverse and then descending colon into the sigmoid. After the fourth fetal month the portion of the cecal colon with the attached small bowel moves downward on the right side of the expanding abdominal cavity to form the ascending colon (Fig. 494).

Let us then consider the various positions occupied by the cecum as follows:

(1) Outside the abdomen.

(2) Within the abdomen close to the umbilicus, low because of the large liver and short mesocolon.

(3) Ascending near cardiac end of the stomach, pushed by mass of small intestine on right side of abdomen.

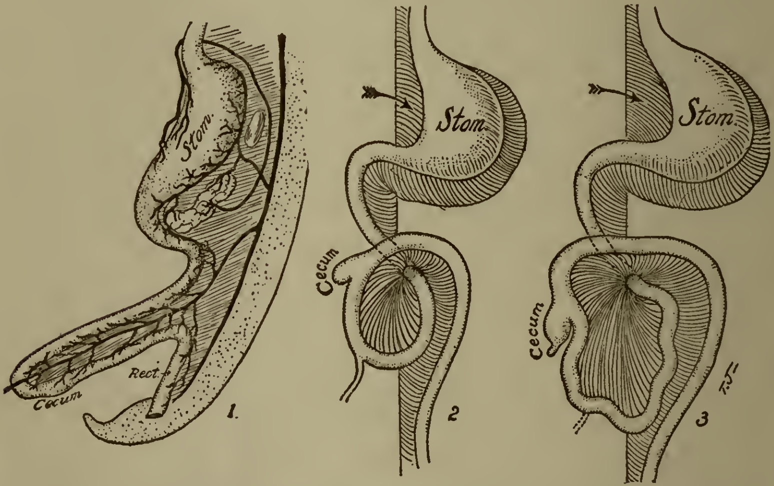

Fig. 494.—1. Early fetal development of alimentary tract before there is much differentiation. 2. Budding of stomach and cecum, with beginning rotation of each. 3. Further fetal development. Stomach well formed. Cecum distinct, lying in upper right quadrant prior to descent.

(4) Rotation beneath the liver into the right side of abdomen.

(5) Descent into right iliac fossa.

The usual position of the cecum and its vermiform appendix is in the right cecal fossa below the pelvic brim. We are conscious of its full descent in the adult; in infants we expect the local findings of appendicitis to be higher—near the umbilical level—and for the most part our incisions for exposure of the appendix in infants are made at a higher level than in adults.

If the expected rotation of colon and cecum about the long axis does not occur, we may find the posterior longitudinal band in front or turned to one side; but if the cecum, before becoming fixed, has rotated without full descent, it is found in the right hypochondrium or even epigastrium, corresponding to the early fetal position. Consequently, the appendix then occupies a site in relation to the liver, kidney, gall-bladder, stomach and duodenum, and may involve them in any pathologic disturbance.

At this time we are especially interested in right upper quadrant appendicitis (I do not mention left-sided appendicitis with transpositions of viscera, etc.), and our inquiry into fetal development has been to demonstrate how, as the result of some interruption in the natural course of its migration, the appendix may lie high on the right side. We must allow, however, that in addition to non-descent other influences may be acting. The cecum may be congenitally short; it may fail to seek a normal level because of a short and fixed mesocolon. Early inflammation may cause its adherence to kidney or liver, or an agglutinative localized peritonitis may plaster it to the duodenum or gall-bladder and cause failure to descend. Moreover, we must consider that an extremely movable cecum with a long, well-fashioned mesocolon may permit a wandering upward of the colon after a normal descent as the result of pathologic processes in neighboring organs, or urged by the pull of peri-appendiceal adhesions high in the abdomen.

The symptoms of right upper quadrant appendicitis do not differ from the classical symptoms produced by inflammation of the normally placed organ. An onset with pain of acute or colicky character, nausea and vomiting, abdominal rigidity, fever, and the leukocytic rise are generally all found. A difference in location, however, makes the physical examination uncertain and puzzling. Early in an attack the pain is near the liver or duodenum, the vomiting usually comes on much quicker, the localized tenderness is high in the gastric region, and because of proximity to the more rapidly absorbing diaphragmatic area we may expect a sharper rise in the white blood count. These points are, of course, governed by the general pathologic conditions surrounding the organ, its previous inflammation or its early rupture, just as in iliac fossa attacks.

To make a differential diagnosis is more difficult than to differentiate between right-sided acute salpingitis and appendicitis in women. One has not the physical signs to be elicited by vaginal examination or the history of venereal infection for guidance. On account of the location most cases are mistaken for acute gall-bladder infection, perforated duodenal or gastric ulcer, stone in the ureter with infected kidney, acute perirenal abscess, and disturbance of the pancreas. Customary points in the history must be diligently examined. Absence of previous stomach

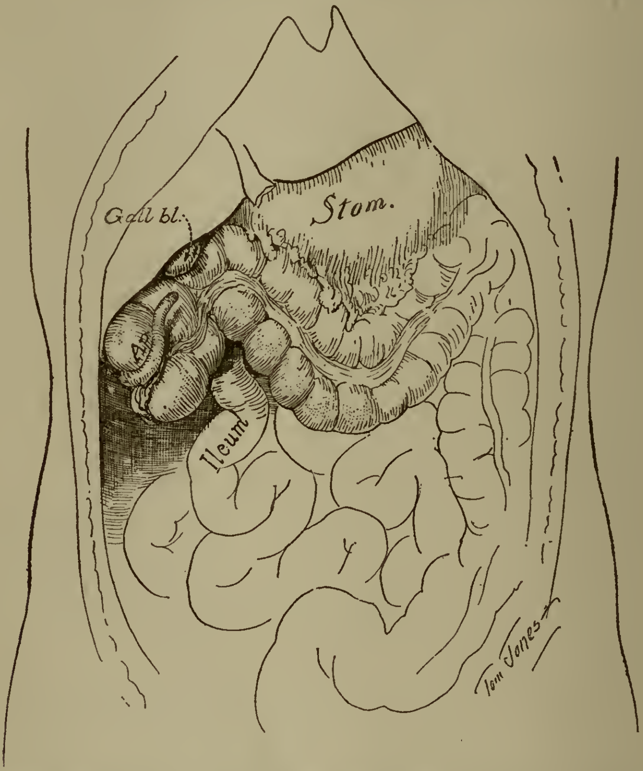

Fig. 495.—Appendix in right upper abdominal quadrant. Cecum rotated but undescended. Appendix lying superficially, its inflammation simulating gall-bladder disease.

disturbance, of gall-bladder pain or previous typhoid or intestinal infection must be ascertained, and a careful urine examination for blood, pus and sugar must be made. Kidney percussion, tenderness, and pancreatic enlargement or other evidence involving the differential diagnosis of upper right abdominal lesions must be considered (Figs. 495, 496).

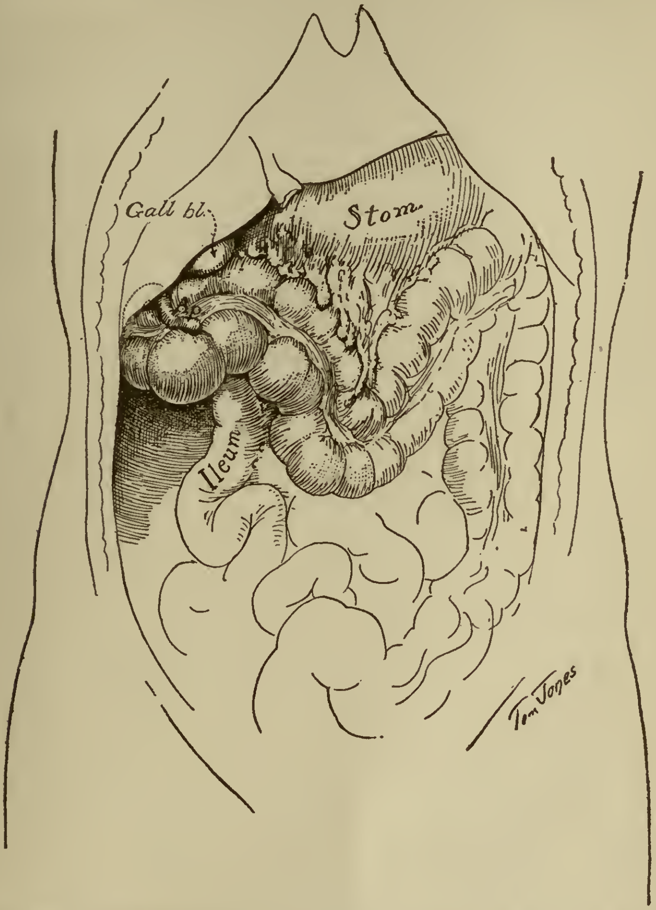

Fig. 496.—Undescended cecum; unrotated so that the appendix lies posteriorly. In this position it may be adherent to perirenal or gall structures and confuse diagnosis with disease of these organs.

These unusually located appendiceal attacks have long been recognized. Turner reported a case in 1863 where the appendix lay very high with no adhesions about it in a position undoubtedly of congenital origin.[1] In 1869 Fagge[2] noted a similar instance. When the abdomen was opened he found the cecum distended and fairly free high in the right abdomen, but it could not be placed in its natural position because that was occupied by other bowel. Mott in 1889[3] recorded an instance of a 7-inch appendix which was turned up behind a high-lying cecum and mesocolon, then crossed the second part of the duodenum, and was attached to the front of the right kidney by its tip. Curschmann cites an instance[4] of a difficult diagnosis in a high-lying appendix and mentions two other patients in whom the organ lay behind and under the liver. Within the last year I have encountered 3 cases of right upper quadrant appendicitis, and for that reason consider the anomaly worthy of attention. All three were in men. The first patient had a typical pain, vomiting, fever attack, with symptoms localized just under the liver. There was a leukocytosis of 12,000; the right iliac fossa was entirely negative. We thought we could exclude kidney and gall-bladder lesions by history and laboratory examination and physical findings and make a diagnosis of perforating duodenal ulcer. At operation I was amazed to find a fresh and fairly well walled-off abscess just below and caudal to a normal gall-bladder, at the bottom of which lay the offending appendix attached to the cecum, not 2 inches from the liver. In the second patient the findings were not so acute because he was not seen until the attack of pain and rigidity began to wear off, and the trouble was considered to be in the gall-bladder. Again we were surprised to find a similar high-lying cecum, with a thick gangrenous appendix, lying rather superficially beneath the abdominal wall, glued to the inferior margin of the gall-bladder. About a month after the second case I encountered a third in an adolescent youth. This time we had more wisdom, and, although there was blood in the urine, and the local findings were again high on the right side, with an absence of tenderness in the right iliac fossa, the onset and symptoms seemed much like an acute appendicitis, and we were not surprised by the findings at laparotomy. Operation disclosed a rather slender appendix, 5 inches long, deep down in the right flank, its tip over the right kidney, surrounded by a plastic exudate but not perforated. It took origin from the cecum at a point about 4 inches from the liver margin, well toward the back, and, although I could feel and see this point, I could do no more than tie off the organ and remove it, no burial of the stump being possible. In this instance I felt that the cecum had only partly rotated and had made little if any descent.

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[1] Edinburgh Med. Jour., 1863, 110.

[2] Guy's Hosp. Reports, XIV, 343, Case 55.

[3] Trans. Path. Soc., London, 40–106.

[4] Deut. Archiv. f. Klin. Med., 1894, 53.

We must recall, then, that acute inflammatory attacks in the right upper quadrant may be caused by the appendix, and our differential diagnosis must include appendicitis.

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